



STA 371G
STATISTICS AND MODELING
SPRING 2012

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Course Objectives

The focus of this course is on learning how to manage uncertainty in business decisions through the use of quantitative models. The topics covered include regression models, time series forecasting models, decision analysis and simulation, with a strong emphasis on how to apply these techniques to real-world problems that arise in business. The techniques taught in the course will also be useful in performing analysis in other BBA courses.

Regression analysis is one of the most powerful methods in statistics. It is particularly useful for determining the relationships between variables and using these relationships to forecast future observations. You will learn how to apply a regression model to real-world data using Excel, test the validity of the model with the available data, draw inferences from the model, and summarize the uncertainty of the inferences. Time series forecasting models are used to forecast future observations of time series data. An example of time series data is the monthly sales of a company. The fundamental idea of time series forecasting models is to use the pattern in the past history of the data (which might include trend, seasonal and/or cyclical components) to forecast future observations. These models also provide a valuable method for quantifying the uncertainty associated with the forecasts.

Decision analysis is a framework that enables you to make decisions that are consistent with an objective in the face of uncertainty. This framework provides a method to evaluate alternatives and to determine the value of acquiring various types of information. Simulation is a computation-based procedure for quantifying the impact of multiple interacting sources of uncertainty on an outcome of interest. Understanding the distribution of the possible outcomes allows both for a better understanding of the risk involved in a particular project as well as the identification of the inputs that are most influential in the project's value.

By the end of the course, you will be able to build models to solve real-world business problems. This involves choosing the appropriate model, performing the correct analysis, validating the model, and drawing the appropriate conclusions.

Materials

Required: Course packet available at University Duplicating

Optional: Custom Textbook: The custom book contains chapters 4-7, 10-12, 15 and 16 from *Data Analysis and Decision Making with Microsoft Excel* (4th edition) by Albright, Winston and Zappe

Software: Excel and the Excel Add-ins Precision Tree and @Risk from the Palisades Decision Tools Suite. The Decision Tools Suite is available for download at www.mcombs.utexas.edu/services/cbacc/coe/ - Click on Decision Tools Standard 5.7.

Course Policies

Grading

The percentage weights associated with your homework, two midterm exams and the final exam are:

	<u>Percentage</u>
Homework	20%
Midterm exam #1	20%
Midterm exam #2	20%
Final exam	40%

There is no predetermined grade distribution for this class.

Homework

- You will receive homework assignments throughout the semester. Although you may discuss the homework problems and solutions among yourselves, every student is expected to hand in a set of solutions that he or she alone has prepared.
- You must show a complete solution (all steps and calculations) to receive credit for a homework problem. However, you do not need to submit computer output used to obtain an answer.
- If you believe a mistake is made in the grading of your homework, you should write a description of the error that you believe was made, attach it to the homework, and resubmit the homework within *one week* of the day it was returned.
- Please check Blackboard regularly to make sure all grades are correctly recorded.

Exams

- The first midterm exam will be given from 6-9pm on Tuesday, February 28 and the second midterm exam will be given from 6-9pm on Tuesday, April 10. If you miss either midterm exam for any reason, the weight of the missed exam will be added to the final exam.
- If you believe a mistake is made in the grading of your midterm, you should write a description of the error that you believe was made, attach it to the midterm, and resubmit the exam within *one week* of the day it was returned.
- The final exam will be given during the University's final exam period. The specific date is determined by the University.
- You may bring one 8½ × 11 inch page of notes and formulas to the exam.
- You should bring a blue book to the midterm and final exams.
- You should bring a calculator to the midterm and final exams.

Helpful Hints

- You are responsible for material covered in class, whether or not it is in the text.

McCombs Classroom Professionalism Policy

The highest professional standards are expected of all members of the McCombs community. The collective class reputation and the value of the learning experience hinges on this.

Faculty are expected to be professional and prepared to deliver value for each and every class session. Students are expected to be professional in all respects.

The classroom experience is enhanced when:

- **Students arrive on time.** On time arrival ensures that classes are able to start and finish at the scheduled time and enhances learning by reducing avoidable distractions.
- **Students minimize unscheduled personal breaks.** The learning environment improves when disruptions are limited.
- **Laptops will not be used in class.** It is not necessary to bring a laptop to class. We will make extensive use of the computer in homework assignments but you will not need to use one in class. You may use a laptop to take notes if you want to although I would recommend against it. There will be some notation used in class (e.g. a few Greek letters and summation signs) that can be difficult to type into a computer unless you are familiar with special symbols.
- **Phones and wireless devices are turned off.** Please be sure to turn off your phones and wireless devices before class begins.

Academic Dishonesty

I have no tolerance for acts of academic dishonesty. Such acts damage the reputation of the school and the degree and demean the honest efforts of the majority of students. The minimum penalty for an act of academic dishonesty will be a zero for that assignment or exam.

- **As specific guidance for this course,** you may not use the homework answers of students in previous classes in any way to assist you in completing the homework questions this year. It is a violation of the honor code in this class to use such assistance.

Students with Disabilities

Upon request, the University of Texas at Austin provides appropriate academic accommodations for qualified students with disabilities. Services for Students with Disabilities (SSD) is housed in the Office of the Dean of Students, located on the fourth floor of the Student Services Building. Information on how to register, downloadable forms, including guidelines for documentation, accommodation request letters, and releases of information are available online at <http://deanofstudents.utexas.edu/ssd/index.php>. Please do not hesitate to contact SSD at (512) 471-6259, VP: (512) 232-2937 or via e-mail if you have any questions.

Syllabus

The information provided below gives the reading assignments for the different topics we will cover during the semester. All page numbers refer to the chapters in the customized book based on *Data Analysis & Decision Making with Microsoft Excel* by Albright, Winston and Zappe. The *Topic Summary Notes* and *Computer Slides* are in the course packet and on the course Blackboard site.

Date	Topic	Reading Assignment
Tuesday, January 17	Introduction Probability concepts Normal distribution	pp. 156-158, 166-168, 211-230; Section 1 of the <i>Computer Slides</i> ; <i>Topic Summary Note: Probability Concepts and Normal Distributions</i>
Thursday, January 19		
Tuesday, January 24	Estimation and sampling distributions	pp. 352-354, 366-373; Section 2 of the <i>Computer Slides</i> ; <i>Topic Summary Note: Estimation and Sampling Distributions</i>
Thursday, January 26	Simple linear regression	pp. 529-535, 542-547, 603-606; Sections 3-5 of the <i>Computer Slides</i> ; <i>Topic Summary Note: Regression Model and Its Estimation</i>
Tuesday, January 31		
Thursday, February 2		
Tuesday, February 7	Multiple regression	pp. 553-556; Sections 6-7 of the <i>Computer Slides</i>
Thursday, February 9	Categorical explanatory variables	pp. 560-566; Section 8 of the <i>Computer Slides</i>
Tuesday, February 14	Regression model for nonlinear relationships	pp. 571-574; Section 9 of the <i>Computer Slides</i> ; <i>Topic Summary Note: Nonlinear Relationships</i>
Thursday, February 16	Correlation and covariance	pp. 106-111, 540-542; Section 10 of the <i>Computer Slides</i> <i>Topic Summary Note: Correlation and Covariance</i>
Tuesday, February 21	Diagnostic tests for the assumptions of the regression model	pp. 644-647; Section 11 of the <i>Computer Slides</i>
Thursday, February 23	Explanatory power of the regression model	pp. 549-551, 556-558; Sections 12-13 of the <i>Computer Slides</i> ; <i>Topic Summary Note: Interpreting and Estimating $Var(\epsilon)$ in a Regression Model</i> ; <i>Topic Summary Note: Computing and Interpreting R^2</i>
Tuesday, February 28	Review for evening exam	-----

Thursday, March 1	Outliers/Forecasting using a regression model	pp. 64-65, 638-643; Section 14 of the <i>Computer Slides</i> ; pp. 648-651; Section 15 of the <i>Computer Slides</i>
Tuesday, March 6	Forecasting: Modeling trend, seasonality and short-term patterns	pp. 671-676, 687-689, 699-702, 729-732; Section 16 of the <i>Computer Slides</i> ; <i>Topic Summary Note: Forecasting Sales of SPSS Computer Manuals</i>
Thursday, March 8		
Tuesday, March 20		
Thursday, March 22	Forecasting: Modeling increasing volatility	Section 17 of the <i>Computer Slides</i>
Tuesday, March 27	Determining the quality of an estimator in a regression model	Section 18 of the <i>Computer Slides</i> ; <i>Topic Summary Note: Measuring the Quality of the Estimate of β</i>
Thursday, March 29	Hypothesis testing in a regression model	pp. 610-611, 620-624; Section 19 of the <i>Computer Slides</i> ; <i>Topic Summary Note: Hypothesis Testing in Regression</i>
Tuesday, April 3	Decision analysis-VRU example	Section 20 of the <i>Computer Slides</i>
Thursday, April 5	Expected value of perfect information-VRU example	Section 21 of the <i>Computer Slides</i>
Tuesday, April 10	Review for evening exam	-----
Thursday, April 12	Expected value of imperfect information-VRU example	Section 22 of the <i>Computer Slides</i>
Tuesday, April 17	Expected value of imperfect information-Hawthorne Plastics case	Section 23 of the <i>Computer Slides</i>
Thursday, April 19	Sensitivity analysis Sci-tools example	Section 24 of the <i>Computer Slides</i> ; <i>Topic Summary Note: Sensitivity Analysis in Precision Tree</i>
Tuesday, April 24	Simulation: Oakland A's case	Section 25 of the <i>Computer Slides</i>
Thursday, April 26	Simulation: Napa Valley Winery case	Section 26 of the <i>Computer Slides</i>
Tuesday, May 1	Simulation: Waldorf Property Development case	Section 28 of the <i>Computer Slides</i>
Thursday, May 3		

The following pages provide specific guidance about the Standard of Academic Integrity at the University of Texas at Austin. Please read it carefully and feel free to ask me any questions you might have.

Excerpts from the University of Texas at Austin Office of the Dean of Students website
(http://deanofstudents.utexas.edu/sjs/acint_student.php)

The Standard of Academic Integrity

A fundamental principle for any educational institution, academic integrity is highly valued and seriously regarded at The University of Texas at Austin, as emphasized in the standards of conduct. More specifically, you and other students are expected to "maintain absolute integrity and a high standard of individual honor in scholastic work" undertaken at the University ([Sec. 11-801](#), *Institutional Rules on Student Services and Activities*). This is a very basic expectation that is further reinforced by the University's [Honor Code](#). At a minimum, you should complete any assignments, exams, and other scholastic endeavors with the utmost honesty, which requires you to:

- acknowledge the contributions of other sources to your scholastic efforts;
- complete your assignments independently unless expressly authorized to seek or obtain assistance in preparing them;
- follow instructions for assignments and exams, and observe the standards of your academic discipline; and
- avoid engaging in any form of academic dishonesty on behalf of yourself or another student.

For the official policies on academic integrity and scholastic dishonesty, please refer to [Chapter 11](#) of the *Institutional Rules on Student Services and Activities*.

What is Scholastic Dishonesty?

In promoting a high standard of academic integrity, the University broadly defines scholastic dishonesty—basically, all conduct that violates this standard, including *any act designed to give an unfair or undeserved academic advantage*, such as:

- Cheating
- Plagiarism
- Unauthorized Collaboration
- Collusion
- Falsifying Academic Records
- Misrepresenting Facts (e.g., providing false information to postpone an exam, obtain an extended deadline for an assignment, or even gain an unearned financial benefit)
- Any other acts (or attempted acts) that violate the basic standard of academic integrity (e.g., multiple submissions—submitting essentially the same written assignment for two courses without authorization to do so)

Several types of scholastic dishonesty—[unauthorized collaboration](#), [plagiarism](#), and [multiple submissions](#)—are discussed in more detail on this Web site to correct common misperceptions about these particular offenses and suggest ways to avoid committing them.

For the University's official definition of scholastic dishonesty, see [Section 11-802](#), *Institutional Rules on Student Services and Activities*.

Unauthorized Collaboration

If you work with another person on an assignment for credit *without the instructor's permission to do so*, you are engaging in unauthorized collaboration.

- This common form of academic dishonesty can occur with all types of scholastic work—papers, homework, tests (take-home or in-class), lab reports, computer programming projects, or any other assignments to be submitted for credit.

- For the University's official definitions of unauthorized collaboration and the related offense of collusion, see Sections [11-802\(c\)\(6\)](#) & [11-802\(e\)](#), *Institutional Rules on Student Services and Activities*.

Some students mistakenly assume that they can work together on an assignment as long as the instructor has not expressly prohibited collaborative efforts.

- Actually, students are expected to complete assignments independently unless the course instructor indicates otherwise. So working together on assignments is *not* permitted unless the instructor specifically approves of any such collaboration.

Unfortunately, students who engage in unauthorized collaboration tend to justify doing so through various rationalizations. For example, some argue that they contributed to the work, and others maintain that working together on an assignment "helped them learn better."

- The instructor—not the student—determines the purpose of a particular assignment *and* the acceptable method for completing it. Unless working together on an assignment has been specifically authorized, always assume it is not allowed.
- Many educators do value group assignments and other collaborative efforts, recognizing their potential for developing and enhancing specific learning skills. And course requirements in some classes do consist primarily of group assignments. But the expectation of individual work is the prevailing norm in many classes, consistent with the presumption of original work that remains a fundamental tenet of scholarship in the American educational system.

Some students incorrectly assume that the degree of any permissible collaboration is basically the same for all classes.

- The extent of any permissible collaboration can vary widely from one class to the next, even from one project to the next within the same class.
- Be sure to distinguish between collaboration that is authorized for a particular assignment *and* unauthorized collaboration that is undertaken for the sake of expedience or convenience to benefit you *and/or* another student. By failing to make this key distinction, you are much more likely to engage in unauthorized collaboration. To avoid any such outcome, always seek clarification from the instructor.

Unauthorized collaboration can also occur in conjunction with group projects.

- How so? If the degree or type of collaboration exceeds the parameters expressly approved by the instructor. An instructor may allow (or even expect) students to work together on one stage of a group project but require independent work on other phases. Any such distinctions should be strictly observed.

Providing another student unauthorized assistance on an assignment is also a violation, even without the prospect of benefiting yourself.

- If an instructor did not authorize students to work together on a particular assignment *and* you help a student complete that assignment, you are providing unauthorized assistance and, in effect, facilitating an act of academic dishonesty. Equally important, you can be held accountable for doing so.
- For similar reasons, you should not allow another student access to your drafted or completed assignments unless the instructor has permitted those materials to be shared in that manner.

Plagiarism

Plagiarism is another serious violation of academic integrity. In simplest terms, this occurs if you represent as *your own work* any material that was obtained from another source, regardless how or where you acquired it.

- Plagiarism can occur with *all* types of media—scholarly or non-academic, published or unpublished—written publications, Internet sources, oral presentations, illustrations, computer code, scientific data or analyses, music, art, and other forms of expression. (See [Section 11-802\(d\)](#) of the *Institutional Rules on Student Services and Activities* for the University's official definition of plagiarism.)
- Borrowed material from written works can include entire papers, one or more paragraphs, single phrases, or any other excerpts from a variety of sources such as books, journal articles, magazines, downloaded Internet

documents, purchased papers from commercial writing services, papers obtained from other students (including homework assignments), etc.

- As a general rule, the use of any borrowed material results in plagiarism if the original source is not properly acknowledged. So you can be held accountable for plagiarizing material in either a final submission of an assignment or a draft that is being submitted to an instructor for review, comments, and/or approval.

Using *verbatim* material (e.g., exact words) without proper attribution (or credit) constitutes the most blatant form of plagiarism. However, other types of material can be plagiarized as well, such as *ideas* drawn from an original source or even its *structure* (e.g., sentence construction or line of argument).

- Improper or insufficient paraphrasing often accounts for this type of plagiarism. (See additional information on [paraphrasing](#).)

Plagiarism can be committed intentionally or unintentionally.

- Strictly speaking, any use of material from another source without proper attribution constitutes plagiarism, regardless why that occurred, and any such conduct violates accepted standards of academic integrity.
- Some students deliberately plagiarize, often rationalizing this misconduct with a variety of excuses: falling behind and succumbing to the pressures of meeting deadlines; feeling overworked and wishing to reduce their workloads; compensating for actual (or perceived) academic or language deficiencies; and/or justifying plagiarism on other grounds.
- But some students commit plagiarism without intending to do so, often stumbling into negligent plagiarism as a result of sloppy notetaking, insufficient paraphrasing, and/or ineffective proofreading. Those problems, however, neither justify nor excuse this breach of academic standards. By misunderstanding the meaning of plagiarism and/or failing to cite sources accurately, you are much more likely to commit this violation. Avoiding that outcome requires, at a minimum, a clear understanding of plagiarism *and* the appropriate techniques for scholarly attribution. (See related information on [paraphrasing](#); [notetaking and proofreading](#); and [acknowledging and citing sources](#).)

By merely changing a few words or rearranging several words or sentences, you are *not* paraphrasing. Making minor revisions to borrowed text amounts to plagiarism.

- Even if properly cited, a "paraphrase" that is too similar to the original source's wording and/or structure is, in fact, plagiarized. (See additional information on [paraphrasing](#).)

Remember, your instructors should be able to clearly identify which materials (e.g., words and ideas) are your own *and* which originated with other sources.

- That cannot be accomplished without proper attribution. You must give credit where it is due, acknowledging the sources of any borrowed passages, ideas, or other types of materials, and enclosing any verbatim excerpts with quotation marks (using block indentation for longer passages).

Plagiarism & Unauthorized Collaboration

[Plagiarism](#) and [unauthorized collaboration](#) are often committed jointly.

By submitting *as your own work* any unattributed material that you obtained from other sources (including the contributions of another student who assisted you in preparing a homework assignment), you have committed plagiarism. And if the instructor did not authorize students to work together on the assignment, you have also engaged in unauthorized collaboration. Both violations contribute to the same fundamental deception—representing material obtained from another source as your own work.

Group efforts that extend beyond the limits approved by an instructor frequently involve plagiarism in addition to unauthorized collaboration. For example, an instructor may allow students to work together while researching a subject, but require each student to write a separate report. If the students collaborate while writing their reports *and* then submit the products of those joint efforts as individual works, they are guilty of unauthorized collaboration as well as plagiarism. In other words, the students collaborated on the written assignment without authorization to do so, and also failed to acknowledge the other students' contributions to their own individual reports.

Multiple Submissions

Submitting the same paper (or other type of assignment) for two courses *without prior approval* represents another form of academic dishonesty.

You may not submit a substantially similar paper or project for credit in two (or more) courses unless expressly authorized to do so by your instructor(s). (See [Section 11-802\(b\)](#) of the *Institutional Rules on Student Services and Activities* for the University's official definition of scholastic dishonesty.)

You may, however, re-work or supplement previous work on a topic with the instructor's approval.

Some students mistakenly assume that they are entitled to submit the same paper (or other assignment) for two (or more) classes simply because they authored the original work.

Unfortunately, students with this viewpoint tend to overlook the relevant ethical and academic issues, focusing instead on their own "authorship" of the original material and personal interest in receiving essentially double credit for a single effort.

Unauthorized multiple submissions are inherently deceptive. After all, an instructor reasonably assumes that any completed assignments being submitted for credit were actually prepared for that course. Mindful of that assumption, students who "recycle" their own papers from one course to another make an effort to convey that impression. For instance, a student may revise the original title page or imply through some other means that he or she wrote the paper for that particular course, sometimes to the extent of discussing a "proposed" paper topic with the instructor or presenting a "draft" of the paper before submitting the "recycled" work for credit.

The issue of plagiarism is also relevant. If, for example, you previously prepared a paper for one course and then submit it for credit in another course without citing the initial work, you are committing plagiarism—essentially "self-plagiarism"—the term used by some institutions. Recall the broad scope of [plagiarism](#): all types of materials can be plagiarized, including unpublished works, even papers you previously wrote.

Another problem concerns the resulting "unfair academic advantage" that is specifically referenced in the University's definition of scholastic dishonesty. If you submit a paper for one course that you prepared and submitted for another class, you are simply better situated to devote more time and energy toward fulfilling other requirements for the subsequent course than would be available to classmates who are completing all course requirements during that semester. In effect, you would be gaining an unfair academic advantage, which constitutes academic dishonesty as it is defined on this campus.

Some students, of course, do recognize one or more of these ethical issues, but still refrain from citing their authorship of prior papers to avoid earning reduced (or zero) credit for the same works in other classes. That underlying motivation further illustrates the deceptive nature of unauthorized multiple submissions.

An additional issue concerns the problematic minimal efforts involved in "recycling" papers (or other prepared assignments). Exerting minimal effort basically undercuts the curricular objectives associated with a particular assignment and the course itself. Likewise, the practice of "recycling" papers subverts important learning goals for individual degree programs and higher education in general, such as the mastery of specific skills that students should acquire and develop in preparing written assignments. This demanding but necessary process is somewhat analogous to the required regimen of athletes, like the numerous laps and other repetitive training exercises that runners must successfully complete to prepare adequately for a marathon.