



STA 371G
STATISTICS AND MODELING

FALL 2011

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| Course Web Page | via Blackboard |

Course Objectives

This course introduces the techniques of Statistical Analysis, Decision Analysis and Simulation, and discusses their application to problems in Business. The techniques taught in the course will also be useful in performing analysis in most other BBA courses.

The Statistical Analysis part of the course focuses on determining the existence of relationships between variables and the quantification of such relationships. The main tool we will use to determine the existence of relationships between variables in data and to quantify the strength of the relationships is Regression Analysis. We will cover examples ranging from the link between CEO performance and company performance, to stock returns of a particular company vs. the entire market, to links between house prices and house characteristics such as size, number of rooms and lot size. In addition we will analyze time series and identify the existence of trends and patterns in data.

Decision Analysis is a framework that enables you to make decisions that are consistent with an objective, in the face of uncertainty. We will learn to evaluate alternatives, and to determine the value of acquiring information. Examples we will cover range from simple decisions, such as accepting or rejecting a project, to complicated ones such as the quantification of the damage to the value of a project due to conflicts between shareholders and bondholders.

Simulation is a 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. Once these influential inputs are identified, decisions can be made regarding the benefit of controlling the outcome by exploring alternatives. Our examples will range from the valuation of oil rigs, oil fields and electricity generators to determining the viability of real estate development projects.

By the end of the course, you should feel comfortable analyzing data and building models to solve particular problems. You should also be able to identify the impact changes in the underlying relationships would have to the outcome of a model, as well as determining whether to collect additional information prior to taking a decision.

While this course will primarily enhance your knowledge and understanding of statistical analysis and allow you to build models appropriate to a business problem, it will also, through class discussion, informal study groups, and formal group homework, strengthen your communication and collaboration skills. Understanding how to analyze data will also provide you with the skills to identify the misuse of

data analysis, while the use of examples in international settings will provide some appreciation of global business practices.

Materials Required

- None – Course package, including notes, and past exams available online.

Optional - Recommended

- Data Analysis and Decision Making with Microsoft Excel, by Albright, Winston, Zappe, revised 3rd edition. Please avoid installing the software that comes with the book – an alternative, professional, version of the software will be available in class.
- Student Solution Manual for selected problems from the textbook, by Kelly B. Nichols-Voss.

Grading

| | Points |
|-----------|----------|
| Homework | 25 |
| Midterm 1 | up to 25 |
| Midterm 2 | up to 25 |
| Midterm 3 | up to 25 |
| Final | up to 75 |

- There will be three midterm exams for this class.
- There is also the possibility of a comprehensive final exam.
- If you take all three midterm exams and are satisfied with your performance you are not required to take the final exam.
- If you miss more than one midterm exam the weight will be added to the final exam.
- You are allowed to take all the midterm exams as well as the final. If you take one or more midterm exams, as well as the final exam, your grade will be determined in the following way:
 - your grade for the final exam will count toward any midterm exam you missed
 - if your grade for the final exam is lower than your grade in a midterm exam, you will keep the grade for the midterm exam
 - if your grade for the final exam is above your grade in a midterm exam, your midterm grade will be adjusted midway between the midterm grade and the final grade.
 - For example, if you received 80 in the first midterm, 85 in the second midterm, missed the third midterm and received 82 in the final exam, your third midterm grade will be set to 82, your first midterm grade will be adjusted to 81, while your third midterm grade will stay at 85.

There is no predetermined grade distribution for this class.

Homeworks

- Half of the homework assignments will be group assignments and only one answer needs to be turned in for all the students. The remaining assignments will be individual and each student will need to work and submit a separate answer.
- Each group should have at most 4 members.
- All homeworks will be due at the beginning of the class following the one they were assigned. All homeworks should be turned in electronically through the class website on Blackboard.
- Since submission is electronic, I will not accept any late homeworks.

- I will drop your lowest homework grade at the end of the semester.

Exams

- Midterm #1 will be in the MOD lab, on Tuesday, September 20th from 6-8 pm.
- Midterm #2 will be in the MOD lab, on Tuesday, October 25th from 6-8 pm.
- Midterm #3 will be in the MOD lab, on Tuesday, November 29th from 6-8 pm.
- The final exam will be in the MOD lab, on Thursday, December 8th, from 7-10 pm.
- All exams will be open-book, open-notes.

Computers and Communication devices

- By the nature of the material, I will be using a computer in every session. You are welcome to follow along with your personal computer
- While the use of computers enhances the learning environment, they (as well as communications devices such as cellphones and iPods) can also be a distraction if used inappropriately. In particular, when students are surfing the web, checking and posting updates on Facebook and Twitter, responding to e-mail, instant messaging each other, and otherwise not devoting their full attention to the topic at hand they are doing themselves and their peers a major disservice. Those around them face additional distraction. Fellow students cannot benefit from the insights of the students who are not engaged. If you engage in behavior described above I will ask you to leave the classroom.
- The use of computers in the exams will be discussed in class.

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.
- **Phones and wireless devices are turned off.** Please be sure to turn off your phones and wireless devices before class begins.

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.

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.

Schedule

The information provided below lists the topics we will cover during the semester. The material is covered, in sequential order, in the notes posted on the course website and I encourage students to go over the material for each class ahead of time. The schedule is tentative and subject to change.

| <u>Date</u> | <u>Topic</u> |
|------------------------|--|
| Aug. 25 | Introduction, StatTools Example: CEO salaries |
| Aug. 30 | Review of normal distribution, sums of random variables Example: Filling Coca Cola bottles Example: Pre-ordering toys |
| Sep. 1 | Introduction to regression Example: CEO performance vs. compensation Example: returns of Amazon vs. S&P 500 |
| Sep. 6 | Measuring the quality of regression: R^2 and β Example: Pizza sales |
| Sep. 8 | Violations of regression assumptions, outliers Example: Alabama Power Example: Voter fraud |
| Sep. 13 | Multiple regression, Dummy variables Example: Truck maintenance Example: Salary determinants |
| Sep. 15 | Model selection: backward regression Example: Sales prices for houses Example: Salary example, continued |
| Sep. 20 | 1 st midterm exam review |
| Sep. 20, 6-8 pm | 1st midterm exam |
| Sep. 22 | Solutions to 1 st midterm |
| Sep. 27 | Time series analysis: no seasonality Example: Detergent sales: moving average, exponential smoothing Example: Detergent sales: using regression |
| Sep. 29 | Time series analysis: seasonality Example: Detergent sales: seasonal indices Example: Detergent sales: using regression with dummy variables |
| Oct. 4 | Introduction to Decision Analysis Example: Drilling for oil |
| Oct. 6 | Decision analysis II Example: Insulating grapefruit Example: TV Pilot |
| Oct. 11 | Decision analysis III Expected Value of Perfect Information, Expected value of Sample Information Example: EVPI – Drilling for Oil Example: EVSI – Drilling for Oil |
| Oct. 13 | Decision analysis IV Example: Ski Resort |
| Oct. 18 | Decision analysis V Example: Sugar Plant |
| Oct. 20 | Decision analysis VI Example: Agency Problem |

Oct. 25 2nd midterm exam review

Oct. 25, 6-8 pm 2nd midterm exam

Oct. 27 Solutions to 2nd midterm

Nov. 1 Introduction to simulation
Example: Drilling for oil

Nov. 3 Simulation II
Example: Investing for retirement
Example: Choosing capacity

Nov. 8 Simulation III
Example: Market share
Example: Consumer satisfaction

Nov. 10 No class

Nov. 15 Simulation IV
Example: Battery replacement

Nov. 17 Simulation V
Example: Oil rig and oil field valuation

Nov. 22 Simulation VI
Example: Electricity generator valuation

Nov. 24 No class – Thanksgiving holiday

Nov. 29 Review for 3rd midterm exam

Nov. 29, 6-8 pm 3rd midterm exam

Dec. 1 Solutions to 3rd midterm

Dec. 8, 7-10 pm Final Exam