BAX-441 – 002 – Intermediate Statistics (Statistical Exploration and Reasoning)

TERM: Fall 2023

LECTURES: Fridays: 12:00 p.m. – 2:50 p.m.

INSTRUCTOR: Mehul Rangwala mrangwala@ucdavis.edu

OFFICE HOURS: I will be available by appointment at mutually convenient times. I will hold weekly Q&A sessions like I did in BAX-400.

TA DISCUSSION SESSIONS: We have two TAs for this course. Each will have an hour of discussion session via Zoom every week. Additional details will be shared on Canvas.

COURSE DESCRIPTION: Students use statistical reasoning and techniques to draw appropriate inferences regarding the meaning of data. Topics include critical statistical thinking, nonparametric tests, simple and multiple regression, diagnostics, and fundamental principles of model building and its techniques. The course covers empirical strategies for applied micro-econometric research questions that include econometric applications of regressions.

PREREQUISITES: Foundations course (BAX-400)

REFERENCE TEXTBOOKS:

1. *Statistics for Management and Economics*, 12e by Gerald Keller. Publisher: Cengage.

2. *Introductory Econometrics: A Modern Approach*, 7th edition by Jeffrey M. Wooldridge.
Publisher: Cengage Learning
ISBN-13: 978-1337558860
ISBN-10: 1337558869

3. *Introductory Econometrics for Finance*, 4th Edition by Chris Brooks. Publisher: Cambridge University Press
ISBN: 9781108436823

4. *A Practical Guide to Using Econometrics*, 7th edition by A. H. Studenmund. Publisher: Pearson

5. *Introduction to Econometrics*, Fifth edition by Christopher Dougherty, Oxford University Press.
ISBN: 978-0-19-967682-8

NOTES AND HANDOUTS: I will upload the notes and the solved examples on Canvas.

COMPUTER PACKAGE: RStudio.

PEDAGOGICAL APPROACH: The class sessions will be interactive with lectures, discussions, and code walkthroughs. After I introduce a topic, we will work on cases and exercises related to the concepts covered in each class session.

GRADING:

Attendance	10%
Homework (Individual)	50%
Midterm Exam	10%
Final Exam	30%

GRADING RULES: Clerical scoring errors will be corrected without hassle, but for other re-grades you must hand back the work and submit a direct message on Slack; the entire assignment will be subject to re-grading. You must submit any re-grading requests via Slack direct message within 5 calendar days from when the assignment is returned. In your message, you should clearly explain why you are requesting a re-grade. While I will consider the specific concerns cited in your message, I will re-grade the entire assignment. Your new score might be higher, lower, or the same as a result. Please remember that small changes in your grade on a single assignment might not affect your overall course grade.

LATE SUBMISSION: Late/email submissions will carry a 20% penalty. Assignments which are submitted after the grades are released and after the solutions are posted will not be accepted under any circumstances.

CLASS ATTENDANCE: Attending all the classes is mandatory in the sections that you are assigned to. Swapping sections will not be allowed under any circumstances. Attendance will be taken in every class. In order to earn attendance points, you need to attend the **entire** class session. Leaving midway (due to any reason) or arriving late (after the signed attendance sheet has been received by me during the class session) will count as not attended. So, it is binary.

GRADE-RELATED AND NON-CONTENT RELATED QUESTIONS: Use direct messages on Slack only for grade-related and personal issues. Please refrain from asking me content-related or grade-related questions via the email. The benefit of using Slack's direct message would be that they don't get buried like the emails.

EXAMS: Exams will be closed-book, closed-notes, and closed-computer. The scope is the topics covered in the entire course plus the topics from the foundations. Please note that the foundations and BAX-441 are not mutually exclusive. We will be referring to the topics in the foundations during our coverage of the topics in this course. Questions will be a mix of conceptual, critical-thinking, and problem-solving. If the exam is scantron-based, then the scantron forms will be provided for the multiple-choice part of the exam. Any scientific or graphing calculator is allowed. Please bring in pencils and your student ID number.

Course Objectives:

1. Gain an appreciation for the breadth of statistical topics available to solve complex business problems in real world and your practicum project.

2. Learn to identify correct statistical methods appropriate for business problems under consideration. Interpret the results and convey the interpretations in a non-technical manner to your audience.

3. Learn to use R for statistical analysis.

4. Be able to critically evaluate reports/articles/research containing statistical information.

5. Prepare you for the advanced topics in the MSBA program.

Additional Points and Suggestions:

1. While there will be focus on mathematical formulas and principles, a significant proportion of time will be spent on intuition behind statistical techniques, analyzing *when* a particular technique should be used, and interpreting/understanding the results from the computer outputs. It is common for analysts to misapply statistical techniques to research problems. So, it is very important to be able to identify and choose correct methods to solve research problem under study.

2. The course textbooks are for reference. However, this course will cover topics beyond those given in the textbooks. My lectures may not always follow the chapters in any particular text. For the most part, my lecture notes and the solved examples should be your primary resource.

3. If you have difficulty with any material, please do not hesitate to contact me. My topmost priority is to ensure that you are successful in understanding of the material and prepare you for the rigorous coursework in the program.

4. The midterm and final exams will be in-class. The formats of the midterm and final exams may be varied. The exams will have conceptual multiple-choice questions. Please note that the purpose of the exams is to assess your understanding of the concepts and your ability to apply concepts discussed in the class. Practice questions with the answer key will be provided.

5. Real learning has happened when you can explain the statistical concepts in your own words to people who don't understand statistics.

Honor Code and Academic Integrity

Academic integrity exists when students and faculty seek knowledge honestly, fairly, with mutual respect and trust, and accept responsibility for their actions and the consequences of those actions. Without academic integrity, there can be no trust or reliance on the effectiveness, accuracy, or value of a University's teaching, learning, research, or public service activities. It is, therefore, key that we understand what academic integrity is, why it is important, and how to help it flourish on college campuses.

1. It is expected that all class members treat each other with respect and dignity.
2. It is not acceptable behavior to insult, harass, or demean any member of the class.
3. Professional business behavior should be modeled in the classroom, including the use of appropriate language, jokes, or stories.

In general, students should adhere to the UC Davis Principles of Community, copied below.

The University of California, Davis, is first and foremost an institution of learning and teaching, committed to serving the needs of society. Our campus community reflects and is a part of a society comprising all races, creeds, and social circumstances. The successful conduct of the university's affairs requires that every member of the university community acknowledge and practice the following basic principles:

We affirm the inherent dignity in all of us, and we strive to maintain a climate of justice marked by respect for each other. We acknowledge that our society carries within it historical and deep-rooted misunderstandings and biases, and, therefore, we will endeavor to foster mutual understanding among the many parts of our whole.

We affirm the right of freedom of expression within our community and affirm our commitment to the highest standards of civility and decency toward all. We recognize the right of every individual to think and speak as dictated by personal belief, to express any idea, and to disagree with or counter another's point of view, limited only by university regulations governing time, place, and manner. We promote open expression of our individuality and our diversity within the bounds of courtesy, sensitivity, and respect.

We confront and reject all manifestations of discrimination, including those based on race, ethnicity, gender, age, disability, sexual orientation, religious or political beliefs, status within or outside the university, or any of the other differences among people that have been excuses for misunderstanding, dissension, or hatred. We recognize and cherish the richness contributed to our lives by our diversity. We take pride in our various achievements, and we celebrate our differences.
We recognize that each of us has an obligation to the community of which we have chosen to be a part. We will strive to build a true community of spirit and purpose based on mutual respect and caring.

For more information, please review the Academic Conduct Booklet:
https://gsm.ucdavis.edu/sites/default/files/2020-10/code_of_conduct_booklet_2020.pdf

Tentative Schedule on the Next Page

Schedule (Tentative)

This is a **tentative** schedule. It may be adjusted according to the pace of the class.

	Date	Assignments Due	Topics Covered
1	09/29/2023		Chi-Squared Tests • Goodness of Fit test • Test of Independence
2	10/06/2023	Homework 1	Basic Ideas of Linear Regression • The Meaning of Regression • The Population Regression Function • The Sample Regression Function • Special Meaning of the Term "Linear" • Method of Ordinary Least Squares • Properties of OLS Estimators and Gauss-Markov Theorem • Inference in Simple Linear Regression
3	10/13/2023		Multiple Regression • Interpreting parameter estimates • Adjusted R-squared • Prediction • Partial F-test
4	10/20/2023	Homework 2	Functional Forms • Polynomial • Reciprocal • lin-log • log-log • log-lin
5	**10/27/2023**	**Midterm Exam (80 minutes in-class)** After the midterm and a 10-minute break, we will cover a topic.	**Scope: BAX-400 topics, Chi-squared tests, Simple Regression, and Multiple Regression. No functional forms.** Dummy Variables – 1 ANOVA and ANCOVA models
6	11/03/2023		Dummy Variables – 2 • Interaction Effects • Seasonal Analysis • Semilog Regressions

	Date	Assignments Due	Topics Covered
7	11/10/2023	Homework 3	Multicollinearity • Detecting and Remedying
8	11/17/2023		Regression Assumptions • The Classical Assumptions • Normality • Heteroscedasticity
9	12/01/2023		Regression Assumptions (continued) • Autocorrelation Model Building • Model Selection Criteria and Tests Variable Selection Techniques • Forward selection • Backward elimination • Stepwise regression
10	12/08/2023	Homework 4	Variable Selection Techniques (continued) • Forward selection • Backward elimination • Stepwise regression Nonparametric Tests • Wilcoxon Rank Sum test • Wilcoxon Signed Rank Sum test • Sign test • Kruskal Wallis test • Friedman test
11	**12/15/2023**	**Final Exam**	**Scope: Comprehensive (BAX-400 and BAX-441 topics)**