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

TERM: Fall 2022

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 optional Q&A sessions like I did in BAX-400.

**TA DISCUSSION
SECTIONS:**   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.

**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 in-class exercises on Canvas.

**COMPUTER
PACKAGE:**   RStudio.

**PEDAGOGICAL
APPROACH:**   The class sessions will be interactive with lectures, discussions,
                                and hands-on exercises/code walkthroughs. After I introduce a
                                topic, we will work on cases and exercises related to the concepts
                                covered in each class session. A laptop with RStudio installed is
                                required.

GRADING: Homework (Individual)   20%
                                Midterm – Part 1   15%
                                Midterm – Part 2   15%
                                Final Exam – Part 1   25%
                                Final Exam – Part 2   25%

GRADING RULES: Clerical scoring errors will be corrected without hassle, but for
                                other re-grades you must hand back the work and submit an email
                                request; the entire assignment will be subject to re-grading. You
                                must submit any re-grading requests via email within 5 calendar
                                days from when the assignment is returned. In your email, you
                                should clearly explain why you are requesting a re-grade. While I
                                will consider the specific concerns cited in your email, 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 submission due to whatever reason 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. Please accept these penalties without
                                wasting time in negotiating with me and convincing me why the
                                assignment should be considered for grading.

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 (Part 1) and questions that will require you to do live coding (Part 2). 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. The Part 2 exam questions will involve problem sets and cases that will require statistical analysis. You will be required to perform quantitative and qualitative analyses for these cases by writing your R code.

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

Academic Honor Code:

All students are expected to adhere to the University of California, Davis' Code of Conduct as noted here: http://sja.ucdavis.edu/files/cac.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	9/23/2022		Chi-Squared Tests • Goodness of Fit test • Test of Independence
2	9/30/2022		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	10/7/2022	Homework 1	Multiple Regression • Interpreting parameter estimates • Adjusted R-squared • Prediction • Partial F-test
4	10/14/2022	Homework 2	Functional Forms • Polynomial • Reciprocal • lin-log • log-log • log-lin
5	**10/21/2022**	**Midterm Exam**	**Scope: BAX-400 topics, Chi-squared tests, Simple Regression, Multiple Regression, and Functional forms.**
6	10/28/2022		Multicollinearity • Detecting and Remedying Dummy Variables – 1 • ANOVA and ANCOVA models
7	11/4/2022		Dummy Variables – 2 • Interaction Effects • Seasonal Analysis • Semilog Regressions

	Date	Assignments Due	Topics Covered
8	11/11/2022	Homework 3	Regression Assumptions • The Classical Assumptions • Normality • Heteroscedasticity • Autocorrelation
9	11/18/2022		Regression Assumptions (continued) • Autocorrelation Model Building • Model Selection Criteria and Tests Variable Selection Techniques • Forward selection • Backward elimination • Stepwise regression
10	12/2/2022	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	12/9/2022	Final Exam – Part 1 Conceptual Final Exam – Part 2 Live Coding	**Scope: Comprehensive (BAX-400 and BAX-441 topics)**