

STATISTICS 1110.

Summer 2024

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Textbook (Optional):

Statistics for Business Decision Making and Analysis by
Robert Stine and Dean Foster,
Pearson Publisher

Course Description:

The course STAT 1110 is designed to achieve an understanding of fundamental notions of data presentation and analysis and to use statistical thinking in the context of business problems. The course deals with modern methods of data exploration (designed to reveal unusual or problematic aspects of databases), the uses and abuses of the basic techniques of inference, and the use of regression as a tool for management and for financial analysis. The potential ethical issues related to each topic will be reviewed. Socially and environmentally relevant data will be utilized throughout the course. The goal is not to turn the students into statisticians but to enable them to appreciate the use of probability in assessing evidence and making decisions, and to be statistically literate consumers of quantitative information generated by economists, biomedical researchers, psychologists, statisticians, survey researchers, and other experts.

Learning Objectives:

By the end of the course, the student should be able to:

- Understand the basic methods of statistics (sampling, correlation and regression) and the essential concepts of statistical thought (probability distributions, estimation, hypothesis testing, and decision theory)
- Construct and use descriptive statistics, graphs, charts, and tables to analyze data sets
- Determine sample sizes for given levels of confidence and margins of error
- Integrate statistical analysis in a decision-making processes

I. Data Analysis

A. Data collection

1. distinction of population and sample
2. types of data: nominal, ordinal, interval, and ratio scaled data
simplicity sometimes reduced to just qualitative and quantitative.
3. importance of data quality and use of appropriate sampling mechanisms

B. Summary statistics and graphical methods

1. measures of location: mean, median, mode
2. measures of scale: range, variance, and standard deviation,

II. Applied probability and inference

A. Basic concept of probability

1. algebra of events
2. definition of probability: equally likely frequency theory, personal probability
3. conditional probability and independence

B. Random variable and their properties

1. definition of random variable
2. probability distribution function
3. mean, variance, and standard deviation of a random variable
4. covariance and correlation of two random variables

C. Important specific distributions

1. discrete uniform distribution
2. hypergeometric distribution
3. binomial distribution
4. Poisson distribution
5. continuous uniform distribution
6. Gaussian (normal) distribution

D. Point and interval estimation

1. Central Limit theorem
2. Confidence intervals for the mean μ .
3. Confidence interval for the binomial proportion p

III. Regression analysis

A. Simple linear regression: assumptions, modeling, inference

1. the linear model: graphical (scatter plot) and theoretical (model building) analysis
2. the principal of least squares
3. assumption of linear least square regression

4. inference in linear regression: t-tests, F-test, R^2
5. prediction
6. checking assumptions in regression: examination of residuals, diagnostics, and residual plots

B. Multiple regression

1. the multiple regression model
2. t-tests versus the F test
3. residual analysis
4. interpretation of multiple regression coefficient
5. multicollinearity

C. Other regression models and problems

1. transformations
2. model selections

Grading:

- Class Attendance & Participation: 10%
- Homework: 10%
- Midterm Exam: 40% Will be announced in class
- Final Exam: 40%. July 3rd
- Exams:
 - Open books and open note
- Problem sets
 - To be done individually
 - Graded based on effort and accuracy

Readings: Assigned material should be read before class to facilitate comprehension, discussion, and coverage. Many of the readings are short, and some you will be asked to merely skim through. All readings are in the class notes that will be distributed before the first class. Use the syllabus as a guide for readings.

Attendance and Participation: Attendance is required in all class sessions for full credit. Students are also expected to participate in class discussion and other in-class activities.

Please make every effort to attend class. There is a strong positive correlation between the learning experience and attendance.

Much of the learning in this course occurs in the classroom. Please note that I have a "no excuses" policy; that is, I only note whether you are in class, not why you are not there.

Therefore, you should be in class BEFORE the start of class (I start on time) and you should stay through the end (I also end on time).

You have one free absence that you should use for EMERGENCY purposes, such as jury duty, surgery, funerals, and other such major events. You can simply send me email saying you are using your free absence.

Problem Sets: Individual assignments are intended to review the material after the class. These are at most four individual assignments roughly at the same degree of difficulty as exam questions. These provide additional opportunities for you to assess your own understanding of the basic ideas. You can talk about the individual assignments with your group members, but the final work must reflect your own understanding and efforts.

Assignments are due at the start of class, and late assignments will not be accepted. If you are unable to attend class, you should email your assignment to the teaching fellow by the start of class. In addition to the assignment that you turn in at the beginning of class, each student should bring an additional copy of the assignment to reference during class.

CODE OF CONDUCT

Some of the ways in which the code applies to this course are discussed below:

- The code of conduct stipulates that a student will “exercise integrity in all aspects of our academic work including, but not limited to, the preparation and completion of exams, papers and all other course requirements by not engaging in any method or means that provides an unfair advantage.”
- An individual’s name on a report should be included only if they have contributed to the analysis. If an individual has not contributed to the analysis in an intellectual manner, it is a violation of the code of conduct to include his or her name.
- Furthermore, you may not refer to write-ups from classes offered in earlier semesters.
- The premise of the code of conduct is that ideas should be attributed to their source. Therefore, please acknowledge the main source(s) of data, facts, and ideas (other than from the instructor or textbook) in all your written work and when you make a presentation. If you use material from a source other than the lecturer, TA, the textbooks or the lecture notes, you must acknowledge the source. For example, say, “I obtained this from the following website: ...”
- You may discuss the homework with your classmates, TA or the Professor. However, you must write them down individually (excluding case assignments which are to be prepared in groups of up to 4 students). The discussion is limited to “how to solve” type of questions. Do not be concerned about getting a wrong answer in the case assignments. These will be graded based on effort. The problem sets will be graded based on effort and correctness.

Inclusion Statement

This course strives to support and cultivate diversity of thought, perspectives, and experiences. The intent is to present materials and activities that will challenge your current perspectives with a goal of understanding how others might see situations differently. By participating in this course, it is the expectation that everyone commits to making this an inclusive learning environment for all.

BIO

Cyrus Mohebbsi was a Managing Director and head of Quantitative Strategists for Global Wealth Management at Morgan Stanley until December 2024 where his team created quantitative models to support trading and banking activities. Before joining Morgan Stanley, he was the head of the ABS Structuring and Analytics Group at HSBC. His group was responsible for structuring and analytics for all ABS product types including home equity loans, auto loans and leases, student loans and credit cards. Cyrus' Wall Street experience includes structuring securities, providing investment analysis, and assisting with asset and liability valuation for Financial Institution and Mergers and Acquisitions. His work has included the development of Corporate Capital Structure models used in the valuation of alternative funding strategies. Prior to joining HSBC, Cyrus was the Head of ABS and CMBS Structuring and Analytics at ABN AMRO. Cyrus began his career on Wall Street in 1987 at Prudential Securities Inc. where he eventually became the head of the Structured Finance/Quantitative Group. This Group structured primary transactions including conforming and non-conforming residential and commercial mortgages, CMOs, manufactured housing loans, leases and CDOs.

Prior to joining Prudential Securities, Cyrus taught Statistics, Marketing and Finance at the Wharton School of the University of Pennsylvania. He is an adjunct professor at the Stern School of Business at New York University and at the Graduate School of Business at Columbia University. Cyrus has published articles in various journals and books.

Cyrus holds an MBA in Management and Accounting from LaSalle University, an MS in Business Statistics from Temple University, and an MA in Marketing, an MA and a Ph.D. in Statistics and Postdoctoral in Management from The Wharton School at the University of Pennsylvania.