PhD 1502 - Quantitative Analysis I

INSTRUCTOR: Dr. Mingfei Li
OFFICE: MOR 380
EMAIL: mli@bentley.edu
TELPHONE: (781) 891-2933
OFFICE HOUR: Tue 2:00 pm-5:00 pm
(Other times by appointment)

COURSE INFORMATION

MEETING DAYS/TIME: Thursday 2:00 pm-4:50 pm
MEETING LOCATION: AAC242

COURSE DESCRIPTION

This is the first course of a two-course sequence in statistical methods and will focus on univariate statistical methods. In the first section of this first course, participants will be provided with a thorough review of descriptive and inferential statistics including classical tests of hypotheses such as tests for means and variances, goodness of fit tests, tests of independence, and analysis of variance tests. More modern non-parametric and bootstrap alternatives to classical tests will be introduced. The second section of the course will cover regression models, both linear and logistic.

LEARNING OBJECTIVES

Knowledge:

For each of the methodologies discussed, we expect that students will be able to:

- Get a general understanding of how each method works
- Recognize why the method is appropriate to a particular research environment
- Understand how to perform the analysis using appropriate software
- Be able to interpret the results in a research context.

Skills:

- Ability to present quantitative research results convincingly and with the ability to address reasonable criticisms of the methods used.

- Capacity to critically read published research articles which make use of the techniques covered.
- Facility with a statistical software package in a research context
- Ability to appropriately develop a written research description of a statistical analysis
- Understand general statistical principles well enough to enable learning additional techniques beyond those covered.

Perspectives:

- An appreciation for the nature of variability and the role of statistical methods in determining relationships between factors and quantifying the amount of inherently random variation in a problem.
- A respect for the power of quantitative research as well as an understanding of the appropriate inferences that can be drawn from particular methods.

COURSE MATERIALS

Textbook:

A second course in statistics: regression analysis, seventh edition, by William Mendenhall and Terry Sincich, published by Pearson/Prentice Hall.

Multivariate Data Analysis, seventh edition, by Hair, Black, Babin, Anderson, Prentice Hall, 2010.

Software: Excel, SPSS

MAJOR TOPICS

- Review on hypothesis tests and linear algebra;
- Simple linear regression and multiple linear model;
- Model building and model selections;
- Residual Analysis;
- Logistic modeling;
- Brief introduction of time series models.

GRADING/PERFORMANCE EVALUATION

The projects will be graded with quality of presentation as a factor. The course grade will be determined as follows:

- Assignments -70%
- In-class discussion - 10%
- Project – 20%

Assignments: The assignments will consist of actual analyses performed on the computer and presented in the form of a commented report, and of summaries of readings of research articles which demonstrate that participants understand the use of the covered techniques in published work.
Final Projects: Both oral and written report will be required.

ACADEMIC INTEGRITY

The Bentley College Honor Code formally recognizes the responsibility of students to act in an ethical manner. The written homework in this course is meant to be an individual exercise. Students will, naturally and appropriately, talk about the problems (this is encouraged) but the final write up **must be a student's own work in its entirety.** This includes all calculations. If two students submit homework problems that have identical and highly unlikely calculation errors, this is evidence that the students did not work on the problem themselves. **If you ever have a question regarding whether your level of collaboration is appropriate, ask Prof. Li.**
Establishing a solid ethical foundation is an important part of your Bentley education and will enhance the value of your degree.

These descriptions and timelines are subject to change at the discretion of the Professor.

Course Tentative Outline

week	Date	Topic	Note
1	9/3	Course introduction Descriptive statistics and an introduction to SPSS.	
2	9/10	Inferential statistics: point estimation and confidence intervals	
3	9/17	Inferential statistics: classical tests of hypothesis	
4	9/24	Inferential statistics: classical tests of hypothesis (con't)	
5	10/1	ANOVA: one-way and two way with interaction effects	
6	10/8	More inferential statistics: classical tests (Chi-square, non-parametric, etc)	
7	10/15	Simple linear regression; analysis of output; residual analysis	
8	10/22	Multiple regression: model building, transformation of variables, interpretation	
9	10/29	Multiple regression(con't): model building, transformation of variables, interpretation	
10	11/5	Multiple regression(con't); pitfalls of regression analysis; association v.s causality	
11	11/12	Multiple regression (con't): interaction effects; Case study: An analysis of rain levels in California	
12	11/19	Multiple regression in research	
13	*12/3*	Logistic regression	
14	*12/10*	Logistic regression(con't), **Final Project Presentations**	
15	12/17	**Final Project Presentations**	