36-201 (Spring 2018)

Statistical Reasoning and Practice

Location and Times:

Spring 2018

Monday & Wednesday 1:30 - 2:50 PM

CMB 1032

Instructor Information:

Taeyong Park, Ph.D.

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Office: CMB 2191

Office Hours: Monday 3:00 - 4:30 PM & Tuesday 1:30 - 3:00 PM

TA: Tehseen Niaz (✉tniaz@andrew.cmu.edu)

CA: Amer Ahmad (✉amera@andrew.cmu.edu)

1. Course Description

This course is designed to teach the statistical methods and computational skills by which you can use data to answer theoretical and practical questions. Throughout the semester, you are expected to develop skills in probability and statistics, learn the tools needed for rigorous statistical analysis, and build a foundation for further studies or applications. More specifically, you will begin with learning probability theory and sampling distributions. These lead into the study of confidence intervals and hypothesis testing. Thereafter, you will learn linear regression analysis, the least squares estimator, and its statistical properties. In addition, you will learn statistical environment R (http://www.r-project.org/). R is widely used in business, economics, biostatistics, social science, and many other fields. It is a powerful programming language for statistical analysis and data visualization. You will use R to manage and analyze data.

2. Prerequisites

- No prerequisite courses. This course is assumed to be your first statistics course.
- No prior knowledge of R is required.

3. Textbooks

- **Required**: David R. Anderson et al. 2017. *Essentials of Statistics for Business and Economics*. 8th Edition. CENGAGE Learning.

- **Optional**: Chris Chapman and Elea McDonnell Feit. 2015. *R for Marketing Research and Analytics*. New York: Springer.

4. Requirements and Evaluation

Reading: No grade on reading. But I recommend you to do the assigned reading as described in the course outline below.

Attendance (10%): Every class, your attendance will be recorded. If you miss one class, you will lose 1 percentage point of your final grade, if you miss two classes, you will lose 2 percentage points, and so on. You are expected to attend class on time and remain in class. If you arrive more than 10 minutes late to class, you will not receive credit. If you leave in the middle of class, you will not receive credit.

In-class Exercise (20%): This course emphasizes hands-on learning. The best way to learn this course's material is to do it. Moreover, it is very important for you to keep up with the course material on a regular basis so that there will be no need to cram. To these ends, you are required to carry out an in-class exercise (a.k.a. quiz) almost every week. After you turn in your assignment, we will discuss the results. This is a group assignment. You can form **a group of two** for each assignment. If you want, you can complete the assignment by yourself. I expect 8 exercises to be done throughout the semester, but it is subject to change depending on the pace of the class. Of your 8 exercise scores, one lowest score will be dropped. This exercise component as a whole is worth 20% of the final grade for the class, and each assignment's credit will be determined based on the number of exercises you will have done in the end of this semester.

Homework Assignment – Problem Sets (20%): You are required to solve 4 problem sets throughout this semester as a homework assignment. Each problem set is worth 5% of the final grade. You should expect that these problem sets will include more challenging questions than the in-class quizzes. Solution sets will be posted on Canvas right after the homework deadline, and hence **no personal extensions will be allowed**. The deadline is before the beginning of class on the date indicated in the course outline below. You are responsible to check that your work is correct using the solution sets posted. You may work with your classmate(s), but **you must write up the solutions on your own**. You must list everyone you worked with on the assignment.

Midterm Exam (20%): Midterm Exam is scheduled for **Feb 28 during class time**. The exam consists of two parts: one is a closed-book written exam and the other is an open-book, R-based exam requiring you to use data sets and R to solve the problems. For the closed-book part of the exam, you are allowed to bring one cheat sheet of A4-size paper. This exam covers the material discussed until the exam day.

Final Exam (30%): Final Exam will be an **in-class exam during the final exam week**. It will require you to use R and real-world data to solve the problems. It will cover the material discussed after the midterm exam.

Letter Grade Distribution:

$$>= 90.00 \quad \text{A}$$
$$80.00 - 89.99 \quad \text{B}$$
$$70.00 - 79.99 \quad \text{C}$$
$$60.00 - 69.99 \quad \text{D}$$
$$<= 59.99 \quad \text{F}$$

5. Grade Appeal Policies

Grade appeals should be submitted **in writing**. You should first send an email to CA Amer Ahmad with a note about why you think your grade should be reconsidered. CA will respond to you with his decision. If you do not agree with his decision regarding your appeal, you can contact me.

6. Electronic Devices and Punctuality

I expect you to be respectful to me and your fellow students to create an environment that is most conducive to learning.

- You will often use your laptop or desktop during class this semester. However, this does not mean that you can feel free to use the computer for whatever you want. It is important to **use it only for class purposes** so that you will not distract yourself and you will not disrupt your classmates. Furthermore, **your cell phone must be turned off** during class. If there is an emergency that might oblige you to be contacted, please talk to me before class. I quote the following passage from the Qatar Business Administration Program Classroom Conduct,

which, I believe, must apply to other programs as well:

- *Laptops are to be closed. When class is in session, you may use your laptop only as directed by your professor. You should not check email, tweet, text, play games, or surf the Internet, any activity that diminishes your or your classmates' engagement with the classroom content and process. If you are unsure whether a given activity is appropriate, ask your professor. This policy extends to all electronic devices. Be sure that your phones and tablets are silenced and stowed before the class begins. Professors may add specific limits on the sharing or use of personal electronics in exam situations.*

- **You must come to class on time and remain in class** once the class has begun. I quote the following passage from the Qatar Business Administration Program Classroom Conduct, which, I believe, must apply to other programs as well:

  - *In common business culture, punctuality is an important part of showing respect for your colleagues and business partners. Showing up late for a meeting tells the others involved that you do not place much value on their time. QBA students will demonstrate respect for their courses, classmates and professors by arriving for class early enough to get settled and prepared before the scheduled meeting time.*

7. Office Hours and Appointments

In general, I encourage you to come to my office whenever you have questions or concerns regarding this course. That said, in order to arrange our meetings efficiently, I have some policies. The best time to meet with me is my office hours: Monday 3:00 - 4:30 PM & Tuesday 1:30 - 3:00 PM. During my office hours, I always keep my door open. In addition to my office hours, you are welcome to come in and meet with me if my door is open and I'm not meeting with someone. If my door is closed, it means that I am not available (out of the office, working on research or teaching prep, etc). I encourage you to set up an appointment to make sure I will be available if you want to see me other than during my office hours.

8. Academic Integrity

You are expected to comply with the academic integrity policy. You are required to refer to CMU's

general policies on cheating and plagiarism: `http://www.cmu.edu/academic-integrity/valuing/index.html`. Violations of CMU's general policies on cheating and plagiarism carry a range of consequences: `http://www.cmu.edu/academic-integrity/understanding/index.html`.

9. Disability Resources and Health and Well-being

You can find information about disability-related accommodations on `https://scotty.qatar.cmu.edu/health-and-wellness/medical-accommodations/`. You may also consult me or CMUQ staff (Office of Health and Wellness) regarding learning disabilities, health, and wellness.

10. Course Outline

Date	Topic	Reading
Jan 8, 10	Introduction to Statistical Methodology	ASWCC Chapter 1.1-1.5
	Lab: Introduction to R	
Jan 15, 17	Descriptive Statistics	ASWCC Chapter 2.1-2.2, 3.1-3.2
	Lab: Basics of R	
	In-class Exercise 1	
Jan 22, 24	Probability Distributions	ASWCC Chapter 5.1-5.4, 6.1-6.3
	Lab: Basics of R and Probability Distributions	
	In-class Exercise 2	
Jan 29, 31	Sampling Distributions	ASWCC Chapter 7.1-7.2, 7.4-7.5
	Lab: Data visualization	
	Problem Set 1 Assigned on Jan 31	
Feb 5, 7	**Problem Set 1 Due on Feb 5**	
	Confidence Intervals	ASWCC Chapter 7.3, 8.1-8.2, 8.4
	Lab: Confidence Intervals I	
Feb 12, 14	Lab: Confidence Intervals II	ASWCC Chapter 8
	In-class Exercise 3	
Feb 19, 21	Hypothesis Testing	ASWCC Chapter 9
	Lab: Hypothesis Testing	
	Problem Set 2 Assigned on Feb 21	
Feb 26	**Problem Set 2 Due on Feb 26**	
	Midterm Exam Review	
Feb 28	Midterm Exam	
Mar 5, 7	SPRING BREAK	

Date	Topic	Reading
Mar 12, 14	Comparing Two Groups I	ASWCC Chapter 10.1-10.2
	Lab: Comparing Two Groups I	
	In-class Exercise 4	
Mar 19, 21	Comparing Two Groups II	ASWCC Chapter 10.4
	Lab: Comparing Two Groups II	
	In-class Exercise 5	
	Problem Set 3 Assigned on Mar 21	
Mar 26, 28	**Problem Set 3 Due on Mar 26**	
	Bivariate Regression	ASWCC Chapter 14.1-14.2, 14.4-14.5
	Lab: Bivariate Regression	
	In-class Exercise 6	
Apr 2, 4	Multivariate Regression I	ASWCC Chapter 15.1-15.5
	Lab: Multivariate Regression I	
Apr 9, 11	Multivariate Regression II	ASWCC Chapter 15.7
	Lab: Multivariate Regression II	
	In-class Exercise 7	
	Problem Set 4 Assigned on Apr 11	
Apr 16, 18	**Problem Set 4 Due on Apr 16**	
	Final Exam Review	