Course Syllabus: SA.340.709.90 and 91.SP21 Statistical Methods for Business and Economics

SP21 / February 1, 2021 – May 13, 2021

Instructor Information

Instructor: John Harrington
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Teaching Assistant Information

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Course Description

Covers basic statistical tools for data analysis. Emphasizes facility in problem-solving in statistical inference and two-variable regression and correlation analysis. Presents descriptive statistics, probability and probability distributions and their use in hypothesis testing. Uses computer to solve problems and to reinforce statistical concepts.

Course Objectives

By the end of this course, students will be able to:

- Use statistics to describe and picture data
- Apply the language of probability to statistics
- Illustrate discrete random variables including Binomial and Poisson
- Describe a continuous random variable including uniform and normal
- Solve binomial distribution problems using the normal approximation to the binomial
- Describe sampling distributions for sample means and sample proportions
- Apply statistical inference to confidence intervals and hypothesis testing
- Apply regression analysis in two variable and multiple variable models

Textbooks and Materials

All textbook readings will be available within Blackboard.

Optional to Purchase

Statistics for Business and Economics, Anderson, Sweeney, Williams, Camm and Cochran, South Western Cengage Learning, 13e (2018) 12e (2014), (note: 10e or 11e should work as well). (Hereafter ASWCC) (eBook is available to rent or buy directly from Cengage or through Amazon)

Calculator. You will need a calculator. A cell phone calculator will be fine. If you purchase a calculator, I suggest you purchase a business/financial calculator such as TI BA II Plus.

Required Software

Microsoft Excel (Microsoft Office 365 is available through the MyJHU SAIS Portal > Technology > Office 365 Portal or the professional version is available from jhu.onthehub.com)

Technology & Skills Requirements

- Reliable high-speed internet service
- Recommend using current version of Chrome or Firefox browser
- Blackboard's supported web browsers
- Navigate and use Blackboard Learn
- Create and save MS Word, Excel and/or PowerPoint documents (Office Help & Training)
- Send, receive, and manage email
- Access your JHU Student Zoom account at https://jhubluejays.zoom.us/

Technology Support

Direct all technical support requests to the SAIS Online and Distance Learning office. We will respond to all requests within 24-48 hours. Requests received on weekends, overnights and holidays will be responded to on the next business day.

- Email: sais.odl@jhu.edu
- Phone: 202-663-5959 | 9:00am – 5:00pm Eastern Time, Monday – Friday
- Visit http://odl.sais.jhu.edu/ for a library of self-guided help documents

Assignments and Grading Policy

This course will be graded based on the following assignments.

Assignments	Percent of Grade	Due Date
Graded Problem Sets	20%	End of Module
Midterm	30%	Mar 14
Final	50%	May 13
TOTAL	**100%**	

This course uses the following grade scale:

Grade	Description	Percent
A	Outstanding	95% to 100%
A-	Excellent	90% and less than 95%
B+	Very good	87% and less than 90%
B	Good	83% and less than 87%
B-	Pass	80% and less than 82%
C+	Low pass	75% and less than 80%
C	Minimal pass	70% and less than 75%
D	Failure	Less than 70%

Assignment General Guidelines

Students are required to adhere to the following guidelines when submitting written assignments, unless otherwise noted in the assignment.

- Handwritten assignments should be written neatly, scanned into a single PDF document and submitted in Blackboard.
- Submit all assignments in Blackboard
- Important Note: Some of the solutions to the problems to be turned in appear to be available. Those solutions involve some "mistakes" that do not match the current problem set. Anyone found copying these answers will end up with a -40 for that problem set which will likely reduce your final grade by one or two grade levels. If this happens more than once, an Honor Code violation will be brought before an Honor Board
- If typing an assignment, use a 12-point font (e.g. Arial, Calibri, Times New Roman), double space and 1-inch margin. Midterm and Final Exams must be handwritten.

Late Policy

Please submit your assignments by the deadlines outlined in the course syllabus and Blackboard. If you are not able to meet an assignment deadline (including the grace period) contact your instructor in advance of the deadline. Each problem set is due at the end of the week. You should make every effort to post the solutions on time. You will be given a two day "grace" period after which you will have .2 points per day deducted from your grade (out of 10 points).

Assignment Feedback

The instructor will return assignments to you within 5-7 days following the due date. Your grade and feedback will be in the My Grades area of Blackboard.

Resubmission of assignments

Expertise comes from practice and learning from our mistakes. If you have earned a low score on a graded problem set, you may revise resubmit within one week. You can earn up to half of the difference between your score the top score. You may not resubmit a midterm or final exam.

Course Structure

This course is divided into 14 modules and topics, each lasting one week.

Each module begins on Monday at 6:00 AM Eastern Time and concludes at 11:59 PM the following Sunday. All module activities and assignments must be completed by the close of the module, except where otherwise noted.

Most modules contain a combination of readings, lectures, online discussions, and assessments. We recommend starting each module by carefully watching the module lectures and reading all assigned materials. This will prepare you to participate in the module discussions and complete the assessments.

Synchronous Sessions

Throughout the term, the instructor will conduct live, synchronous sessions in Zoom. The sessions will be recorded. You may opt out by from identification in the recording by muting your audio, not enabling video, and not typing into the chat panel.

Attendance for synchronous sessions is highly recommended but not required. If you cannot attend a synchronous session, you will be responsible for watching the recording later. Recorded sessions will be posted in Blackboard within 24-48 hours of the session.

Class meetings recorded by the instructor (or Teaching Assistant) may be shared with students in the class for instructional purposes related to this class. Students are **not** permitted to copy or share the recording with others.

Synchronous sessions will occur

- Section 90: Mondays at 6:00 PM Eastern Time
- Section 91: Tuesdays at 8:00 AM Eastern Time

Here are some tips for participating in a live session.

Course Participation

Active participation in discussions and group activities is expected We recommend you log into Blackboard regularly throughout the week - a daily check-in is recommended. Interacting with your peers in this course is integral to your success in this course and throughout the program.

Communication & Online Etiquette

Primary communication in an online course is text. It is important to communicate respectfully. Please review and follow these Ground Rules for Online Discussions.

For questions regarding course assignments that would be of interest to other students, please post those in the Q&A Discussion forum. Questions of a personal nature regarding course activities and

assignments, please send an email message to the instructor. Use your JHU email account to correspond with the instructor/TA. Include the course title in the subject line and be sure to sign your full name. Emails will be responded to within 48 hours.

All email will be sent to your JHU email account, so be sure to check the account regularly.

Changes to the Course

Changes to the course will be posted in the Announcements.

Honor Code Statement

Enrollment at SAIS obligates each student to conduct all activities in accordance with the rules and spirit of the school's Honor Code located in The Red Book: SAIS Student and Academic Handbook. The Honor Code governs student conduct at SAIS. It covers all activities in which students present information as their own, including written papers, examinations, oral presentations and materials submitted to potential employers or other educational institutions. It requires that students be truthful and exercise integrity and honesty in their dealings with others, both inside SAIS and in the larger community.

While the Honor code goes well beyond plagiarism, it is important that each student understand what is and is not plagiarism. Plagiarism will result in failure of the paper or exam and may result in failing the course depending on the judgment of the professor. Note: All papers submitted for this course will be automatically processed by an anti- plagiarism system to ensure the integrity of work.

Course Schedule: SA.340.709.90 and 91.SP21 Statistical Methods for Business and Economics

SP21 / February 1, 2021 – May 13, 2021

This schedule is subject to change with fair notice. Any changes will be posted in the Course Announcements.

Module	Module Title	Dates	Readings	Recorded Lecture Topics	Assignments (Due Dates)
1	Descriptive Statistics	Feb 1 – Feb 7	ASWCC: Chapters 1-3 *(most of the lecture/discussion material will be from Chapter 3; Chapters 1 and 2 should be read)*	How to Use Excel for Statistics Excel - Basic Descriptive Statistics 1.1 Numerical and Categorical Data 1.2 Pie and Bar Charts 1.3 Histogram for Cross Section Data 1.4 Graphing Time Series 1.5 Mean of Population and Sample 1.6 Median of Sample or Population 1.7 Mean Deviation (Mean Absolute Error) for Population and Sample 1.8 Standard Deviation for a Population 1.9 Standard Deviation for a Sample 1.10 Measuring Z values: Definition of an Outlier 1.11 Chebychev's Theorem 1.12 Percentiles 1.13 Scatter Plot between two variables	Practice problem set Graded problem set (Feb 7)

Module	Module Title	Dates	Readings	Recorded Lecture Topics	Assignments (Due Dates)
				1.14 Sample Correlation Coefficient: Measuring Linear Relationship Between Two Variables	
2	Probability	Feb 8 – Feb 14	ASWCC: Chapter 4	2.1 Basics of Set Theory 2.2 Definition of Probability 2.3 Developing the "or" Rule 2.4 Conditional Probability 2.5 Developing the "and" Rule 2.6 Numerical Example of Statistical Dependence 2.7 Bayes Theorem 2.8 Example of Bayes Theorem with Three Mutually Exclusive Events	Practice problem set Graded problem set (Feb 14)
3	Discrete Random Variables	Feb 15 – Feb 21	ASWCC: Chapter 5.1-5.4	3.1 Define a Discrete Random Variable 3.2 Expected Value of a Discrete Random Variable 3.3 Standard Deviation of a Discrete Random Variable 3.4 Covariance for a Joint Probability Distribution 3.5 Application of Covariance to Financial Analysis	Practice problem set Graded problem set (Feb 21)
4	Examples of Discrete Probability Distributions: Binomial Probability Distribution and	Feb 22 – Feb 28	ASWCC: Chapter 5.5 - 5.6	4.1 Permutations and Combinations 4.2 Binomial Experiment; Applying the Binomial Formula; Distribution; Histogram	Practice problem set Graded problem set (Feb 28)

Module	Module Title	Dates	Readings	Recorded Lecture Topics	Assignments (Due Dates)
	Poisson Probability Distribution			4.3 Mean and Standard Deviation of a Binomial Random Variable 4.4 Application of Binomial Probability Distribution with Histogram 4.5 Poisson Experiment and Poisson Distribution – Application random over space 4.5(Example) Poisson Experiment and Poisson Distribution – Application random over space 4.6 Poisson Experiment and Poisson Distribution – Application random over time Readings and Resources	
5	Uniform and Normal Probability Distributions	Mar 1 – Mar 7	ASWCC: Chapter 6.1-6.3	5.1 Continuous Uniform Probability Distribution 5.2 Cumulative Uniform Probability Distribution 5.3 Standard Normal Probability Distribution 5.4 Areas Under the Standard Normal Probability Distribution 5.5 Areas Under a General Normal Probability Distribution 5.6 Normal Approximation for the Binomial	Practice problem set Graded problem set (Mar 7)

Module	Module Title	Dates	Readings	Recorded Lecture Topics	Assignments (Due Dates)
6	Review and Midterm Assessment	Mar 8 – Mar 14	Review Modules 1-5	Review Modules 1-5	Midterm (Mar 14)
7	Sampling Distributions	Mar 15 – Mar 11	ASWCC: Chapter 7	7.1 Sampling Distribution from a Normally Distributed Population 7.2 Central Limit Theorem 7.3 Example of Distribution of Sample Means 7.4 Distribution of Sample Proportions	Practice problem set Graded problem set (Mar 11)
8	Statistical Inference I	Mar 22 – Mar 28 (Mar 22 – Spring Break Day Off)	ASWCC: Chapter 8	8.1 Calculate a confidence interval for μ with large sample (Population not normally distributed Standard Deviation not Known) 8.2 Calculate a confidence interval for μ with Small Sample (Population Normally Distributed and Standard Deviation not known) 8.3 Calculate a Confidence Interval for p 8.4 Calculate a sample size.	Practice problem set Graded problem set (Mar 28)
9	Hypothesis Testing I	Mar 29 – Apr 4 (Mar 30 – Spring Break Day Off)	ASWCC: Chapter 9	9.1 Conduct a Hypothesis Test for μ with Large Sample 9.2 Conduct a Hypothesis Test for μ with Small Sample 9.3 Conduct a Hypothesis Test for p	Practice problem set Graded problem set (Apr 4)

Module	Module Title	Dates	Readings	Recorded Lecture Topics	Assignments (Due Dates)
10	Statistical Inference and Hypothesis Testing II	Apr 5 – Apr 11	ASWCC: Chapter 10	10.1 Confidence Interval for the Difference of Population Means 10.2 Confidence Interval for the Difference of Population 10.3 Hypothesis Testing for Difference of Population Means (large samples) 10.4 Hypothesis Testing for the Difference of Population Means (small samples) 10.5 Hypothesis Testing for Difference of Population Means with Paired Samples 10.6 Hypothesis Testing for the Difference of Population Proportions	Practice problem set Graded problem set (Apr 11)
11	Applications of Chi-squared distribution: Contingency Tables; Example of Non-parametric (Distribution Free) statistical test	Apr 12 – Apr 18 (Apr 14 – Spring Break Day Off)	ASWCC: Chapter 12.2 and Chapter 18.2	11.1 Test of Independence of Two Categorical Variables: Chi Squared Distribution Applied to Survey Analysis 11.2 Applying Mann Whitney Test to Difference of Sample Means (small samples); Comparing results between use of t-test and Mann-Whitney test	Practice problem set Graded problem set (Apr 18)
12	Two Variable Linear Regression – Estimation and Sampling Distribution	Apr 19 – Apr 25 (Apr 22 – Spring Break Day Off)	ASWCC: Chapter 14.1-14.3	12.1 Developing and Using Scatter Plot 12.2 Developing Least Squares Formulas 12.3 Applying Least Squares Formulas	Practice problem set Graded problem set (Apr 25)

Module	Module Title	Dates	Readings	Recorded Lecture Topics	Assignments (Due Dates)
				12.4 Decomposition of the Sums of Squares; the r-squared 12.5 Examining the Excel Regression Output	
13	Two Variable linear Regression – Confidence Intervals and Hypothesis Testing; Introduction to Multiple Regression	Apr 26 – May 2 (Apr 30 – Spring Break Day Off)	ASWCC: Chapter 14.4-14.9	13.1 Population Model Assumptions and Simulation of Sampling Distribution 13.2 Confidence Interval for Population Slope 13.3 Hypothesis Testing for Population Slope with t distribution 13.4 Analysis of Variance for Regression Table with F test 13.5 Prediction in Two Variable Regression 13.6 Introduction to Multiple Regression	No Graded problem set
14	Review and Final Exam	May 3 – May 13	Review All Modules	Review All Modules	Final Exam (May 13)