Applied Statistics for Management

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Course Description

Which region of Pakistan has the lowest rates of literacy in 2020? To what extent does the recent ban on Plastic Bags in Islamabad reduce threat to the environment? What causes individuals to vote? In what sense (if any) does democracy (or trade) reduce the probability of war? Does learning performance vary between schools with and without ICT facilities?

Social scientists often address the above and many other questions by using statistical methods that are informed by theories in social sciences. Statistics allows us to draw conclusions from a set of data and is often called the "*Science of Data*". It can also help people in every industry answer their research or business questions and can help predict outcomes.

In this course, we provide an introduction to the tools used in basic quantitative social science research. The first part of the course covers the basic use of statistics in research while the remainder of the course focuses on causal inferences and the use of linear regressions in empirical research. Furthermore, the principles learned in this course provide a foundation for the future study of more advanced topics in quantitative methodology-something that is essential for prospective research students. We will cover both the theoretical and computational aspects of statistics, understanding important theorems, and learning how to analyze real data. While the tools of statistical inference are worth studying in their own right, another goal of this course is to provide graduate students with the necessary skills to critically read, interpret, and replicate the quantitative content of many management and social science articles. Our understanding will be supported through the use of statistical software called STATA during our practical exercises.

Prerequisites

The most important prerequisite is the willingness to work hard on possibly unfamiliar material. Statistical methods are like a language, and it will take time and dedication to master its vocabulary, its grammar, and its idioms. This presents a challenge for us as instructors to give you the best intuition and a challenge for you as a student to work hard to internalize that intuition.

Objectives:

- To familiarize students with the basic concepts in statistics applied to real-life problems solving in public policies and management.
- To introduce students to the use of statistical techniques in applied research.
- To develop quantitative skills in students to prepare them for future evidence-based policy research.

Course Material:

Since this course is designed to blend multiple areas of statistics, econometrics, economic theory, and public policy, therefore, the material distributed among you will come from a variety of sources. Relevant material for each section and topic will be distributed and students will be asked to read them well before each class. Besides those materials, the following books and web sources are recommended for general understanding:

Main Text:

Text 1: Applied Statistics for Public and Non-Profit Administration 9th Edition by Kenneth J. Meier, Jeffrey L. Brudney and John Bohte, (2014), Cengage Learning USA.
Text 2: *Research Methods: The Essential Knowledge base* by William Trochim, (2015),

Tentative Evaluation Criteria:

Finals	50-60
Mid/Projects/Assignment*	20-30
Quiz/Class Participation	10-20

Course Outline

Course Content (Weekly)

Week	Lecture Topic	Reading
1	• Introduction to the Course • Some basic Concepts in Applied Statistics	Text 1: Chapter 1
2	• **Measurement** ○ Theory of Measurement ○ Measurement Validity ○ Measurement Reliability ○ Increasing Reliability ○ Measuring Reliability	Text 1: Chapter 2
3	• **Sampling** ○ Nonprobability Sampling ○ Probability Sampling: Procedures	Text 2: Chapter 4
4	• **Data Preparation** ○ Logging the Data ○ Checking the Data for Accuracy ○ Developing a Database Structure ○ Entering the Data into the Computer ○ Data Transformations	Text 2: Chapter 11
5	• **Data and Descriptive Statistics** ○ Frequency Distributions ○ Graphical Presentations ○ Practical Activity	Text 1: Chapter 4
6	• **Measures of Dispersion** ○ The Standard Deviation ○ The shape of a Frequency Distribution and Measures ○ of Central Tendency ○ Using Measures of Dispersion and Central ○ Tendency Together	Text 1: Chapter 6
7	• **Probability in Applied Social Sciences** ○ The Normal Probability Distribution ○ A Measurement Technique Based on Standard Normal Scores	Text 1: Chapter 7

8	• **Inferential Statistics** ○ Some Definitions ○ Estimating a Population Mean ○ Estimating a Population Standard Deviation ○ The Standard Error ○ How Sample Size Affects the Standard Error	Text 1: Chapter 10
9	• **Hypothesis Test** ○ Steps in Hypothesis Testing ○ The Importance of Stating the Null and Alternative ○ Hypotheses Correctly ○ Testing Hypotheses with Population Parameters	Text 1: Chapter 11
10	• **Estimating Population Proportions** ○ Estimating a Population Proportion ○ Determining Sample Size ○ Decision Making	Text 1: Chapter 12
11	• **Testing the Difference between Two Groups** ○ Stating the Research and Null Hypotheses for Difference of Means Tests ○ Difference of Means Procedure ○ Understanding the Three Major Difference of Means Tests	Text 1: Chapter 13
12	• **Regression Analysis Application** ○ Relationships between Variables ○ Measures of Goodness of Fit ○ The Standard Error of the Estimate	Text 1: Chapter 17
13	• **Regression Analysis Continued** ○ The Coefficient of Determination ○ The Standard Error of the Slope	Text 1: Chapter 17
14	• **Key Assumptions of Linear Regression**	Text 1: Chapter 18
15	• **Multiple regression** ○ Application and key assumption	Text 1: Chapter 20
16	• **Research Ideas/ Project Presentation**	
	• **Final – Term Exam Week**	