Course Overview

Title: Applied Statistics for Business (Using Excel)
Title: STAT241
Hours: 50
Number of Credits: 5
Prerequisites: None
Term: Winter, Spring, Summer
Language: English

Learning Outcomes

This is an introductory course designed to get you started with business data. The ability to understand and interpret data is becoming increasingly important in the industry. A good understanding of statistics is a requirement to make correct and relevant interpretations of data. This course will give you a working knowledge of Excel with the aim of getting to use it for more advance topics in Business and Finance. It will take you from basic operations such as reading data into excel using various data formats, organizing and manipulating data, to various advanced functionality (like confidence interval, hypothesis testing) of Excel using examples.

Assessment Criteria

- Homework (60%): During the course there will be assignments about the topics discussed in class.
- Final project (40%): By the end of the term, each student will be assigned individual project where they can apply the various skills they have developed to a real life data set.
Sessions

Session 1: Introduction to Excel Spreadsheets - In this session, you will be introduced to the use of Excel spreadsheets and various basic data functions of Excel. Topics covered include:

- Reading data into Excel using various formats
- Basic functions in Excel, arithmetic as well as various logical functions
- Formatting rows and columns
- Using formulas in Excel and their copy and paste using absolute and relative referencing

Session 2: Functions - This module introduces various Excel functions to organize and query data. Topics covered include:

- IF and the nested IF functions
- VLOOKUP and HLOOKUP
- VLOOKUP across worksheets
- The RANDBETWEEN function

Session 3: Introduction to Filtering, Pivot Tables, and Charts - This session introduces various data filtering capabilities of Excel. You’ll learn how to set filters in data to selectively access data. A very powerful data summarizing tool, the Pivot Table, is also explained and we begin to introduce the charting feature of Excel.

- Data filtering in Excel
- Use of Pivot tables with categorical as well as numerical data

Session 4: Graphing and Charting techniques - We will explores basic and advance graphing and charting techniques available in Excel. Topics include

- Introduction to the charting capability of Excel
- Line, Bar and Pie charts
- Pivot charts
- Scatter plots
- Histograms

Session 5: Data Descriptors - Here we will try to understand, calculate and interpret various descriptive or summary measures of data. These descriptive measures summarize data using a few numbers.

- Categories of descriptive data
- Measures of central tendency, the mean, median, mode, and their interpretations and calculations
- Measures of spread-in-data, the range, interquartile-range, standard deviation and variance
• Box plots
• Interpreting the standard deviation measure using the rule-of-thumb and Chebyshev’s theorem

Session 6: Descriptive Measures of Association, Probability, and Statistical Distributions - We introduce the covariance and correlation measures and their respective Excel functions. We will discuss the notion of causation versus correlation. The session then introduces the notion of probability and random variables and starts introducing statistical distributions.

• Measures of association, the covariance and correlation measures; causation versus correlation
• Probability and random variables; discrete versus continuous data
• Introduction to statistical distributions

Session 7/8: The Normal Distribution - This module introduces the Normal distribution and the Excel function to calculate probabilities and various outcomes from the distribution. You’ll also see various applications of the Normal distribution. You will also get introduced to the Binomial and Poisson distributions. The Central Limit Theorem is introduced and explained in the context of understanding sample data versus population data and the link between the two

• Probability density function and area under the curve as a measure of probability
• The Normal distribution (bell curve), NORM.DIST, NORM.INV functions in Excel
• Various applications of the Normal distribution
• The Binomial and Poisson distributions
• Sample versus population data; the Central Limit Theorem

Session 9/10: Confidence intervals Here we will discuss what a confidence interval is and how is its constructed. We will introduce the various building blocks for the confidence interval such as the t-distribution, the t-statistic, the z-statistic and their various excel formulas. We will then use these building blocks to construct confidence intervals and look at the various business applications.

• Introducing the t-distribution, the T.DIST and T.INV excel functions
• Conceptual understanding of a Confidence Interval
• The z-statistic and the t-statistic
• Constructing a Confidence Interval using z-statistic and t-statistic
• Applications of Confidence Interval
• Confidence Interval for a Population Proportion
• Sample Size Calculation
• Hypothesis Testing, An Introduction
Session 11: **Hypothesis Testing** - The four steps for conducting a hypothesis test are introduced and you get to apply them for hypothesis tests for a population mean as well as population proportion. You will understand the difference between single tail hypothesis tests and two tail hypothesis tests and also the Type I and Type II errors associated with hypothesis tests and ways to reduce such errors.

- The Logic of Hypothesis Testing
- The Four Steps for conducting a Hypothesis Test
- Single Tail and Two Tail Hypothesis Tests
- Guidelines, Formulas and an Application of Hypothesis Test
- Hypothesis Test for a Population Proportion
- Type I and Type II Errors in a Hypothesis

Session 12: **Hypothesis Test - Differences in Mean** Here we’ll apply Hypothesis Tests to test the difference between two different data. We will introduce the three kinds of difference in means test and apply them to various business applications. We will also introduce the Excel dialog box to conduct such hypothesis tests.

- Introducing the Difference-In-Means Hypothesis Test
- Applications of the Difference-In-Means Hypothesis Test
- The Equal & Unequal Variance Assumption and the Paired t-test for difference in means.
- Some more applications

**Main Readings**

- ‘Modern Business Statistics with Microsoft Excel’ by David R. Anderson, Dennis J. Sweeney, Thomas A. Williams
- ‘Microsoft Excel 2013 Data Analysis and Business Modeling’ by Wayne Winston