

Business Statistics

Course Outcome Summary

Course Information

Organization	Madison Area Technical College
Developers	Corine A. Thompson
Development Date	4/1/2009
Course Number	10-102-104
Instructional Level	Associates Degree
Instructional Area	Finance
Division	Center for Business & Applied arts
Total Credits	3

Description

In Business Statistics the objective is to provide students majoring in management, marketing, finance, accounting and other fields of business with an introduction to descriptive and inferential statistics. We focus on business applications and appropriate statistical techniques are studied for the systematic collection, presentation, analysis and interpretation of experimental results, including surveys, quality control and Six Sigma concepts. The course includes descriptive statistics, basic probability theory, sampling distributions and the Central Limit Theorem; the binomial, normal, and Student t distribution; uses techniques of 1- and 2- sample tests, linear regression, correlation, and time series analysis. Statistical procedures in Excel are used to analyze data sets.

Target Population

Business Management, Finance

Types of Instruction

Instruction Type	Contact Hours	Credits
Face to Face		3

Textbooks

Lind, Marchal, Wathen. *Statistical Techniques in Business & Economics*. McGraw-Hill. **Edition:** 13th or 14th.

Learner Supplies

Calculator with exponential capability, Financial calculator preferred.

Excel based learning models will be used.

Prerequisites

Beginning Excel, 10-103-133

Math of Finance 10-804-144

Exit Learning Outcomes

Core Abilities

- A. Critical Thinking
- B. Mathematics
- C. Science and Technology

Competencies

Unit I. Introduction

1. Analyze the importance of statistics in modern life

Linked Core Abilities

Critical Thinking

Competence will be demonstrated:

o in the solution to a problem on a quiz, homework, project or exam

Performance will be successful when:

o you identify concrete situations in a variety of disciplines and in ordinary life where the knowledge of statistics is essential

o you analyze the importance of statistics advancing science and acquiring knowledge

2. Employ appropriate language in describing research data

Competence will be demonstrated:

o in the solution on a quiz, homework, project or exam

Performance will be successful when:

o you distinguish between population and sample data

o you differentiate data as quantitative or qualitative

o you identify numerical data as measuring at the normal, ordinal, interval or ratio level

o you explain the importance of random sampling for making statistical inference

o you compare different random sampling techniques identifying situations for which each is appropriate

o you determine whether a study is observational or experimental and recognize different methods appropriate to each

o you assess a given study as to the presence and likely importance of confounding variables

Unit II. Descriptive Statistics

1. Employ appropriate representations of sample data

Linked Core Abilities

Science and Technology

Competence will be demonstrated:

o in the solution on a quiz, homework, project or exam

Performance will be successful when:

o you generate frequency, relative frequency and cumulative frequency distributions from a given set of sample data

o you construct a histogram to represent a distribution

o you construct a frequency polygon to represent a distribution

o you construct a scatter plot diagram of bivariate data

o you identify the most appropriate form for representing a distribution given the type of data and the questions being asked

2. Calculate measures of central tendency

Linked Core Abilities

Mathematics

Competence will be demonstrated:

o in the solution on a quiz, homework, project or exam

Performance will be successful when:

o you calculate the mean of a data set

o you calculate the median of a data set

o you calculate the mode of a data set

o you recognize variations in procedures for computing each of the measure given for specific circumstances

- o you evaluate the appropriateness of each measure of central tendency given the type of data and research concerns

3. Calculate measure of spread

Linked Core Abilities

Mathematics

Competence will be demonstrated:

- o in the solution on a quiz, homework, project or exam

Performance will be successful when:

- o you calculate the quartile, decile and percentile ranks for a given data set
- o you interpret the quartile, decile and percentile ranks as measure of position
- o you calculate the range for a given data set
- o you calculate the population or sample standard deviation for a given set of data
- o you calculate the interquartile range for a given data set
- o you evaluate the appropriateness of the standard deviation, range and interquartile range as measures of spread given the type of data and research concerns

4. Compare and contrast distributions

Linked Core Abilities

Critical Thinking

Competence will be demonstrated:

- o in the solution on a quiz, homework, project or exam

Performance will be successful when:

- o you compare two distributions with respect to central tendency
- o you compare two distributions with respect to spread
- o you calculate normal scores (z-scores) for given data values
- o you interpret normal scores appropriately
- o you construct a back-to-back stem-and-leaf plots to aid comparisons
- o you construct modified box-and-whiskers plots to aid comparisons
- o you interpret differences in center and spread of distributions in practical terms
- o you apply Chebyshev's theorem and the Empirical Rule to discuss limitations on variation and the meaning of 'unusual' as it applies to data values in a distribution

5. Assess relationship between variables in a bivariate data set

Linked Core Abilities

Mathematics

Competence will be demonstrated:

- o in the solution on a quiz, homework, project or exam

Performance will be successful when:

- o you distinguish between dependence and independent variables
- o you calculate the correlation coefficient
- o you interpret correlation coefficient appropriately
- o you calculate constant and slop coefficient for linear regression line using the Ordinary Least Squares procedure
- o you use constant and slop coefficient to graph the 'best fitting' line to a set of sample data
- o you make reasonable predictions using the mean of the dependent variables or the least squares prediction equation, as appropriate
- o you assess the strength of the linear relationship between the variables in the sample

Unit III. Probability

1. Employ general rules to compute probabilities of individual and joint probability events

Linked Core Abilities

Critical Thinking

Mathematics

Competence will be demonstrated:

- o in the solution on a quiz, homework, project or exam

Performance will be successful when:

- o you identify probability experiments, their outcomes and random variables
- o you interpret probability by means of the classic, relative frequency and subjective understandings
- o you distinguish theoretical and empirical probabilities
- o you use combinatorics to compute number of outcomes in a given event
- o you represent sample space by listing all outcomes, using Venn diagrams, constructing tree diagrams or building tables
- o you use representation of the sample space and the basic definition of probability to compute probabilities of given events
- o you employ special and general rules of addition to compute probabilities of disjoint events
- o you recognize conditional probabilities
- o you use special and general rules of multiplication to compute probabilities of conjoint events
- o you distinguish between statistically dependent and independent events
- o you apply mathematical rules for computing probabilities to solve application

2. Assess probabilities of events using probability distributions for discrete random variables

Linked Core Abilities

Critical Thinking

Mathematics

Competence will be demonstrated:

- o in the solution on a quiz, homework, project or exam

Performance will be successful when:

- o you generate a probability distribution for a discrete random variable from empirical data
- o you generate a binomial distribution for appropriate random variables using formulae and tables
- o you generate a multinomial distribution for appropriate random variables using formula and tables
- o you generate a hypergeometric distribution for appropriate random variables using formula and tables
- o you generate Poisson distribution for appropriate random variables using formula and tables
- o you calculate the mean of a given discrete distribution
- o you calculate the standard deviation and variance of a given discrete distribution
- o you compute expected values for a discrete random variable
- o you interpret expected value
- o you calculate probabilities of events based on the distribution of discrete random variables to solve application problems
- o you show all work in a clear and logical manner and verify solutions

3. Assess probabilities of events using probability distributions for continuous random variables

Linked Core Abilities

Critical Thinking

Mathematics

Competence will be demonstrated:

- o in the solution on a quiz, homework, project or exam

Performance will be successful when:

- o you employ appropriate notation and accurate pictures when representing continuously distributed random variables
- o you calculate probabilities of events based on a uniform distribution for a continuous random variable given appropriate parameter values

- o you calculate probabilities of events based on a normal distribution for a continuous random variable given appropriate parameters
- o you employ the normal distribution to estimate binomial probabilities
- o you calculate probabilities of events based on the distribution of continuous random variables to solve application problems
- o you show all work in a clear and logical manner and verify solutions

Unit IV. Inferential Statistics

1. Derive distributions for sample statistics

Linked Core Abilities

Mathematics

Competence will be demonstrated:

- o in the solution on a quiz, homework, project or exam

Performance will be successful when:

- o you apply the central limit theorem to find the mean and variance of the sample average for a given distribution
- o you apply the central limit theorem to determine when the distribution of a sample average follows a normal or a student's t-distribution
- o you calculate the mean and variance of a sample proportion by applying the binomial distribution
- o you determine the normality of the distribution of sample proportions
- o you apply the chi-square distribution to describe the distribution of sample variance

2. Estimate population parameters using sample data

Linked Core Abilities

Mathematics

Competence will be demonstrated:

- o in the solution on a quiz, homework, project or exam

Performance will be successful when:

- o you construct confidence interval for the population mean given sample data selecting the appropriate procedure
- o you construct confidence interval for the population standard deviation given sample data
- o you construct confidence interval for a population proportion given sample data
- o you interpret confidence intervals appropriately
- o you calculate the minimum sample size necessary to estimate a population parameter to a given level of confidence

3. Estimate differences in population parameters using sample data

Linked Core Abilities

Mathematics

Competence will be demonstrated:

- o in the solution on a quiz, homework, project or exam

Performance will be successful when:

- o you construct confidence intervals for difference in population means given sample data selecting the appropriate procedure
- o you construct confidence intervals for differences in population standard deviations given sample data
- o you construct confidence intervals for differences in population proportions given sample data
- o you interpret confidence intervals appropriately

4. Assess the validity of statements about population parameters using sample data

Linked Core Abilities

Critical Thinking

Mathematics

Competence will be demonstrated:

- o in the solution on a quiz, homework, project or exam

Performance will be successful when:

- o you carry out hypothesis test for the population mean given sample data using appropriate parametric procedures
- o you carry out hypothesis test for the population mean given sample data using appropriate non-parametric procedures
- o you carry out hypothesis test for the population standard deviation given sample data
- o you carry out hypothesis test for a population proportion given sample data
- o you interpret hypothesis tests, drawing reasonable conclusions and stating them succinctly in standard English

5. Assess the validity of statements about differences in population parameters using sample data**Linked Core Abilities**

Critical Thinking

Mathematics

Competence will be demonstrated:

- o in the solution on a quiz, homework, project or exam

Performance will be successful when:

- o you carry out hypothesis tests for differences in population means given sample data using appropriate parametric procedures
- o you carry out hypothesis tests for differences in population means given sample data using appropriate non-parametric procedures
- o you carry out hypothesis tests for differences in population variances given sample data using appropriate parametric procedures
- o you carry out hypothesis tests for differences in population variances given sample data using appropriate non-parametric procedures
- o you carry out hypothesis tests for differences in population proportions given sample data
- o you interpret hypothesis tests, drawing reasonable conclusions and expressing them succinctly in standard English

6. Assess the relationship between two variables in a population using bivariate sample data**Properties**

Domain: Psychomotor

Linked Core Abilities

Critical Thinking

Mathematics

Competence will be demonstrated:

- o in the solution on a quiz, homework, project or exam

Performance will be successful when:

- o you compute the correlation coefficient for a set of bivariate data
- o you conduct a significance test on the sample correlation coefficient
- o you compute the constant and slope coefficients of a linear regression using the method of Ordinary Least Squares given sample data
- o you apply constant and slope coefficients from a linear regression to describe the relationship between variables in a bivariate sample
- o you construct confidence interval to estimate the expected value of the dependent variable in the population given sample data and a value of the independent variable
- o you construct a prediction interval to estimate the realized value of the dependent variable in the population given sample data and a value of the independent variable

7. Assess the 'goodness of fit' of a theoretical model

Linked Core Abilities

Critical Thinking

Mathematics

Competence will be demonstrated:

- o in the solution on a quiz, homework, project or exam

Performance will be successful when:

- o you apply an appropriate procedure to assess how well a given theoretical model fits a set of sample data
- o you interpret hypothesis tests, drawing reasonable conclusions, and expressing them succinctly in standard English