STAT 210 Statistics for Business

Zachariah Muhlenkamp

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Xavier University  
Statistics for Business I (STAT 210)  
Smith Hall G21  
Fall 2014

Instructor: Zachariah Muhlenkamp  
Actuary  
Western & Southern Financial Group

Office Hours: After class, as needed  
By appointment (McDonald Library room 134)

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Text: Jaggia, Sanjiv & Kelly, Alison  
Business Statistics - Communicating with Numbers (2013)  
Not Required, but recommended. Will probably need for 211.

Catalog Description: Statistics for Business I is designed to make students familiar with:  
descriptive statistics, basic probability, normal distribution, confidence intervals, regression,  
correlation, hypothesis tests, and analysis of categorical data within the context of business  
data; including the use of technology appropriate to business applications of these statistical  
concepts. Pre-requisites: MTH 120 & INFO 200

My goals for you in this class are as follows:  
- To learn the expected material  
- To develop into a better student  
- To become more prepared for your future career

My expectations for you are:  
- To be engaged during class-time  
- To work ahead  
- To be courteous towards your peers, myself, and this class

I will help you succeed by:  
- Being as straightforward as possible  
- Being conscious of your time  
- Making myself as available to you as possible

Exam Dates  
MIDTERM TBA Chapters 1-6  
FINAL TBA Chapters 1-9
Student Assessment and Evaluation

1) Quizzes 33.3%
2) Midterm Exam 33.3%
3) Final Exam 33.3%

Quizzes are individual, closed book, and closed note. They will tend to be multiple choice or numerical answers. I will provide you with the quiz questions (different values but otherwise the same), detailed solutions, and notes ahead of time – all you have to do is look at the material and figure out how to solve the quiz questions prior to class (essentially your homework for this course). If there is any problem you can’t figure out on your own, I will be happy to assist you via email or during my office hours.

Tip: Give yourself time to get help in the event you can’t figure something out. If you plan to be completely prepared for Thursday’s class by Tuesday afternoon, then you can attend my office hours if you get stumped on something. If you wait until Thursday to look at the material you might not give yourself enough time to learn it. I usually won’t be able to assist people who send me questions the day of class, as I will be engaged at Western & Southern.

Attendance will be reflected through your quizzes. There are no make ups for any reason what-so-ever: not being present in class to take a quiz will result in a 0.

Homework: No formal homework will be assigned, except to prepare for class by taking my practice quizzes. These will be nearly identical to the quizzes you will have in class and your exams. If you give yourself an adequate amount of time between each class to master the practice quizzes, you will get an A in this course. I encourage everyone to retake the practice quizzes each week until you can score an 100% from scratch.

Course and Instructor Evaluation The standard faculty evaluation form will be provided during the last week of the semester. Each student will have the opportunity to anonymously evaluate the course and instructor.

Grade Distribution

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<td>F</td>
<td>Below 60</td>
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CLASS POLICIES

1. Treat this environment like your future work environment
2. Everything is subject to change, as needed.
3. If you want to negatively express a concern or issue to me, please do so outside of a classroom setting (after class or office hours), where I am able to better listen to and address your needs.
4. Quizzes and exams can not to be retaken on a different day. I accommodate to emergencies for the exams. In such a case, the exam will be of greater length and difficulty.
5. Your grade is a reflection of your achievement in the course and knowledge of the subject matter: it is not relative to any other student, but to the material in this course.

ACADEMIC HONESTY

- If I believe you are cheating, I will give you a zero on the quiz or exam at hand
- If I know you are cheating, you will receive an F for the course and I will request for your expulsion from the University of Xavier.
- If you see another student cheating, please respect the academic integrity of class and notify me. In this case, there will be no formal punishment towards anyone in the class: I will only confidentially ask the student at hand to retake the quiz or exam.
CONTENT COVERED IN COURSE

Ch. 1 Statistics and Data
1.1. The Relevance of Statistics
1.2. What Is Statistics?
   The Need for Sampling
   Types of Data
   Getting Started on the Web
1.3. Variables and Scales of Measurement
   The Nominal Scale
   The Ordinal Scale
   The Interval Scale
   The Ratio Scale
   Synopsis of Introductory Case
   Conceptual Review

Ch. 2 Tabular and Graphical Methods
2.1. Summarizing Qualitative Data
   Picturing Frequency Distributions for Qualitative Data
   Using Excel to Construct a Pie Chart
   Using Excel to Construct a Bar Chart
   Cautionary Comments when Constructing or Interpreting Charts or Graphs
2.2. Summarizing Quantitative Data
   Guidelines for Constructing a Frequency Distribution
   Visualizing Frequency Distributions for Quantitative Data
   Using Excel to Construct a Histogram
   Contents note continued: 2.3.Stem-and-Leaf Diagrams
2.4. Scatterplots
   Using Excel to Construct a Scatterplot
   Writing with Statistics
   Sample Report-Gas Prices across the United States
   Additional Exercises and Case Studies
   Case Studies

Ch. 3 Numerical Descriptive Measures
3.1. Measures of Central Location
   The Arithmetic Mean
   The Median
   The Mode
   Using Excel to Calculate Measures of Central Location
3.2. Percentiles and Box Plots
   Calculating the pth percentile
3.3. The Geometric Mean
   The Geometric Mean Return
   The Average Growth Rate
3.4. Measures of Dispersion
   Range
   The Mean Absolute Deviation
   The Variance and the Standard Deviation
   The Coefficient of Variation
Using Excel to Calculate Measures of Dispersion

3.5. Mean Variance Analysis and the Sharpe Ratio
3.6 Chebyshev's Theorem and the Empirical Rule
Contents note continued: Chebyshev's Theorem
  The Empirical Rule

3.7. Summarizing Grouped Data
3.8. Covariance and Correlation
  Using Excel to Calculate Covariance and the Correlation Coefficient
Sample Report - Analyzing Speed Limits

Ch. 4 Introduction to Probability
4.1. Fundamental Probability Concepts
  Events
  Assigning Probabilities
  Probabilities Expressed as Odds
4.2. Rules of Probability
  The Complement Rule
  The Addition Rule
  Conditional Probability
  Independent and Dependent Events
  The Multiplication Rule
4.3. Contingency Tables and Probabilities
4.4. The Total Probability Rule and Bayes' Theorem
  The Total Probability Rule
  Bayes' Theorem
4.5. Counting Rules

Ch. 5 Discrete Probability Distributions
5.1. Random Variables and Discrete Probability Distributions
  The Discrete Probability Distribution
5.2. Expected Value, Variance, and Standard Deviation
  Expected Value
  Variance and Standard Deviation
  Risk Neutrality and Risk Aversion
5.3. Portfolio Returns
  Properties of Random Variables
  Expected Return, Variance, and Standard Deviation of Portfolio Returns
5.4. The Binomial Probability Distribution
  Using Excel to Obtain Binomial Probabilities
5.5. The Poisson Probability Distribution
  Examples of Poisson Random Variables with Respect to Time
  Examples of Poisson Random Variables with Respect to Space
  Contents note continued: Using Excel to Obtain Poisson Probabilities
5.6. The Hypergeometric Probability Distribution
  Using Excel to Obtain Hypergeometric Probabilities
Sample Report - Comparison of Salary Plans "Not Covered"

Ch. 6 Continuous Probability Distributions
6.1. Continuous Random Variables and the Uniform Probability Distribution
  The Continuous Uniform Distribution
6.2. The Normal Distribution
Characteristics of the Normal Distribution
The Standard Normal Variable
Finding a Probability for a Given z Value
Finding a z Value for a Given Probability
Revisiting the Empirical Rule
6.3. Solving Problems with Normal Distributions
The Normal Transformation
The Inverse Transformation
Using Excel for the Normal Distribution
6.4. Other Continuous Probability Distributions
Contents note continued: The Exponential Distribution
Using Excel for the Exponential Distribution
The Lognormal Distribution
Using Excel for the Lognormal Distribution
Sample Report—Absolute Grading versus Relative Grading "Not Covered"

Ch. 7 Sampling and Sampling Distributions
7.1. Sampling
Classic Case of a "Bad" Sample: The Literary Digest Debacle of 1936
Sampling Methods
The Special Election to Fill Ted Kennedy's Senate Seat
7.2. The Sampling Distribution of the Sample Mean
The Expected Value and the Standard Deviation of the Sample Mean
Sampling from a Normal Population
The Central Limit Theorem
7.3. The Sampling Distribution of the Sample Proportion
The Expected Value and the Standard Deviation of the Sample Proportion
7.4. The Finite Population Correction Factor
7.5. Statistical Quality Control
Control Charts for Quantitative Data
Using Excel to Create a Control Chart
Control Charts for Qualitative Data
Sample Report—Customer Wait Time
7.A1. Appendix
Derivation of the Properties of the Sample Mean
Derivation of the Properties of the Sample Proportion "Not Covered"

Ch. 8 Estimation
8.1. Point Estimators and Their Properties
Properties of Point Estimators
8.2. Confidence Interval of the Population Mean When σ Is Known
Constructing a Confidence Interval for μ When σ Is Known
The Width of a Confidence Interval
8.3. Confidence Interval of the Population Mean When σ Is Unknown
The t Distribution
Contents note continued: Constructing a Confidence Interval for μ When σ Is Unknown
Using Excel to Construct Confidence intervals
8.4. Confidence Interval of the Population Proportion
8.5. Selecting a Useful Sample Size
Selecting n to Estimate μ
Selecting \( n \) to Estimate \( p \)

**Ch. 9 Hypothesis Testing**

9.1. Introduction to Hypothesis Testing
   - The Decision to "Reject" or "Not Reject" the Null Hypothesis
   - Defining the Null Hypothesis and the Alternative Hypotheses
   - Type I and Type II Errors

9.2. Hypothesis Test of the Population Mean When \( \sigma \) Is Known
   - The \( p \)-Value Approach
   - The Critical Value Approach
   - Confidence Intervals and Two Tailed Hypothesis Tests
   - Using Excel to Solve Hypothesis Tests
   - One Last Remark

9.3. Hypothesis Test of the Population Mean When \( \sigma \) Is Unknown
   - Using Excel to Calculate \( p \)-Values from the \( t \) Distribution

9.4. Hypothesis Test of the Population Proportion