

# MSOM 606: Analytical Tools for Management Decisions

**Prerequisites: None**

**Credits: 3**

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## I. Course Description

The goal for this course is to prepare students to be more effective users of quantitative information, as well as to avoid the many potential pitfalls from the misuse of statistical methods. The emphasis is on understanding what a previously obtained data set implies and, if appropriate, to develop meaningful forecasts with a reasonable sense of confidence. Specific topics include data analysis and statistical description, sampling and statistical inference, time series, and regression analysis.

## II. Course Objectives

After completing this course, you should be able to:

1. Define the roles of data and predictive analytics in business, including time-series data.
2. Differentiate between deductive and inductive reasoning and reasoning from sample to population.
3. Explain the scientific method and differentiate experimental from nonexperimental data.
4. Explain linear regression as a descriptive tool, and correlation vs causality in regression analysis.
5. Define methods for establishing causal inference.
6. Identify and describe limited dependent variables and the linear probability model.
7. Articulate remedies for identification problems and inference challenges due to variable co-movement.

## III. Course Textbooks and Readings

***\*Students must purchase in advance texts and/or materials for this course.***

Prince, J. T. (2019). Predictive analytics for business strategy: Reasoning from data to actionable knowledge. New York, NY: McGraw-Hill Education. ISBN-13: 978-1-259-19151-0

## **IV. Weekly Information**

### **Module One – Week 1**

#### **Roles of Data and Predictive Analytics in Business**

##### **Objectives**

At the end of this Module, you should be able to:

- 1.1 Explain how predictive analytics can help in business strategy formulation.
- 1.2 Describe a data-generating process.
- 1.3 Describe the primary ways that data analysis is used to aid business performance.
- 1.4 Discriminate between active and passive prediction.
- 1.5 Recognize questions pertaining to business strategy that may utilize (active) predictive analytics.

##### **Reading**

Chapter 1: The Roles of Data and Predictive Analytics in Business (pp. 1-31)

Article: McKinsey & Company article titled “The B2B analytics playbook: Capturing unrealized potential in telcos (March, 2019).

Video: “What is Business Analytics?” Closed caption is available.

##### **Lecture**

Chapter 1: The Roles of Data and Predictive Analytics in Business (PowerPoint)

##### **Deliverables**

Discussion: Class Introductions. Main posts due on Thursday and replies are due on Sunday.

Discussion: Business strategy and analytics. Main posts due on Thursday and replies are due on Sunday.

Assignment: Business strategy and predictive analytics, due on Sunday.

Quiz: Chapter 1, due on Sunday.

### **Module Two – Week 2**

#### **Reasoning with Data; Reasoning from Sample to Population**

##### **Objectives**

At the end of this module, you should be able to:

- 2.1 Define reasoning.
- 2.2 Explain an empirically testable conclusion.
- 2.3 Differentiate between deductive and inductive reasoning.
- 2.4 Explain how inductive reasoning can be used to evaluate an assumption.
- 2.5 Explain the reasoning inherent in a confidence interval.
- 2.6 Explain the reasoning inherent in a hypothesis test.
- 2.7 Describe selection bias in inductive reasoning.

## **Reading**

Read in your textbook:

Chapter 2: Reasoning with Data (pp. 32-54)

Chapter 3: Reasoning from Sample to Population (pp. 55-82)

Article: MIT SMR Connections article titled "Data, Analytics, & AI: How Trust Delivers Value."

Video: Hypothesis testing and p-values. Closed caption is available.

## **Lecture**

Chapter 2 (Reasoning with Data) and chapter 3 (Reasoning from Sample to Population) PowerPoints

## **Deliverables**

Discussion: Reasoning to evaluate an assumption, confidence intervals, and testing hypotheses. Main posts due on Thursday and replies are due on Sunday.

Assignment: Reasoning for constructing confidence intervals and selection bias, due on Sunday.

Quiz: Chapters 2 and 3. Due on Sunday.

## **Module Three – Week 3**

### **The Scientific Method: The Gold Standard for Establishing Causality**

## **Objectives**

At the end of this Module, you should be able to:

- 3.1 Recall the elements of the scientific method.
- 3.2 Explain how experiments can be used to measure treatment effects.
- 3.3 Differentiate experimental from nonexperimental data.
- 3.4 Explain a treatment effect.
- 3.5 Generate a question of causality.

## **Reading**

Chapter 4: The Scientific Method: The Gold Standard for Establishing Causality (pp. 83-112)

Article: Harvard Business Review "8 Things to Do Before You Run a Business Experiment"

## **Lecture**

Chapter 4: The scientific method PowerPoint

Video: The Scientific Method: Steps, Examples, Tips and Exercise

## **Deliverables**

Discussion: The scientific method in your organization. Main posts due on Thursday and replies are due on Sunday.

Assignment: Selected end of chapter questions, due on Sunday.

Quiz: Chapter 4, due on Sunday

## **Module Four – Week 4**

### **Linear Regression as a Fundamental Descriptive Tool; Correlation vs. Causality in Regression Analysis**

#### **Objectives**

At the end of this Module, you should be able to:

- 4.1 Explain passive prediction using regression.
- 4.2 Discuss active prediction using regression.
- 4.3 Differentiate between correlation and causality.
- 4.4 Discuss the relevance of R-squared.
- 4.5 Distinguish the relevance of model fit between passive and active prediction.

#### **Reading**

Chapter 5: Linear Regression as a Fundamental Descriptive Tool (pp. 113-150)

Chapter 6: Correlation vs Causality in Regression Analysis (pp. 151-186)

Article: Journal of the National Cancer Institute titled “Editorial: When Is Correlation Causation?”

Video: How Ice Cream Kills! Correlation vs. Causation. Closed caption is available.

#### **Lecture**

Chapter 5 (Linear Regression) and 6 (Correlation vs Causality in Regression Analysis PowerPoints

#### **Deliverables**

Discussion: Active and Passive Prediction using Regression. Main posts due on Thursday and replies are due on Sunday.

Assignment: Selected end-of-chapter questions for chapters 5 and 6, due on Sunday.

Quiz: Chapters 5 and 6, due on Sunday.

## **Module Five – Week 5**

### **Basic and Advanced Methods for Establishing Causal Inference**

#### **Objectives**

At the end of this Module, you should be able to:

- 5.1 Explain the consequences of key assumptions failing within a causal model.
- 5.2 Explain how control variables can improve causal inference from regression analysis.
- 5.3 Explain how instrumental variables can improve causal inference in regression analysis.
- 5.4 Evaluate which type of variables may be used as instrumental variables.

## **Reading**

Chapter 7: Basic Methods for Establishing Causal Inference (pp. 187-223).

Chapter 8: Advanced Methods for Establishing Causal Inference (pp. 224-257).

Article: The C-Word: Scientific Euphemisms Do Not Improve Causal Inference from Observational Data.

## **Lecture**

Chapter 7 Basic methods for establishing causal inference PowerPoint.

Chapter 8 Advanced methods for establishing causal inference PowerPoint.

Video: Statistical vs. Causal Inference: Causal Inference Bootcamp.

## **Deliverables**

Discussion: Assessing Key Assumptions and improving causal inference in regression analysis. Main posts due on Thursday and replies are due on Sunday.

Assignment: Causal Inference Methods. Selected end-of-chapter questions, chapter 7, due on Sunday.

Quiz: Chapters 7 and 8, due on Sunday.

## **Module Six – Week 6**

### **Prediction for a Dichotomous Variable**

## **Objectives**

At the end of this Module, you should be able to:

- 6.1 Identify a limited dependent variable and its applications.
- 6.2 Describe the linear probability model.
- 6.3 Identify the merits and shortcomings of probit and logit models.

## **Reading**

Chapter 9: Prediction for a Dichotomous Variable (258-291).

Article: Models for Binary Choices: Linear Probability Model

Video: No video is posted this week. There are numerous YouTube videos explaining linear probability models and other models discussed in chapter 9.

## **Lecture**

Chapter 9: Prediction for a Dichotomous Variable PowerPoint

## **Deliverables**

Discussion: Limited Dependent Variable and Linear Probability Model. Main posts due on Thursday and replies are due on Sunday.

Assignment: Limited Dependent Variables. Answer selected end-of-chapter questions for chapter 9, due on Sunday.

Quiz: Chapter 9, due on Sunday.

## **Module Seven – Week 7**

### **Identification and Data Assessment**

#### **Objectives**

At the end of this Module, you should be able to:

- 7.1 Explain what it means for a variable's effect to be identified in a model.
- 7.2 Explain extrapolation and interpolation and how each inherently suffers from an identification problem.
- 7.3 Articulate remedies for identification problems and inference challenges due to variable co-movement.

#### **Reading**

Chapter 10: Identification and Data Assessment (pp. 291-321)

Article: McKinsey & Company "Achieving business impact with data."

Video: Harvard Business Review "Business Analytics Defined."

#### **Lecture**

Chapter 10, Identification and Data Assessment, PowerPoint

#### **Deliverables**

Discussion: Identification and Data Assessment. Main posts due on Thursday and replies are due on Sunday.

Assignment: Identification and Data Assessment end-of-chapter questions for chapter 10, due on Sunday.

Quiz: Chapter 10, due on Sunday.

## **V. Course Information and Grading**

Course Requirements (Weekly) Each Module will be based on the inclusion and grading of the following segments: Discussion Boards, Assignments/ Case Studies/ Projects, and Quizzes.

#### **Class Discussions**

Successful online learning requires active and meaningful participation in the Discussion Board Forum. Critical thinking, appropriate use of judgment and professional comments are required for all responses. Simple agreement or disagreement with a fellow student does not constitute a quality response. Student opinions are important but must be supported by relevant data obtained in the literature or text.

1. One initial discussion board post is due by the fourth day (Thursday @ 11:59 pm) of each weekly module and two response posts are due by the last day (Sunday @ 11:59 pm) of each weekly module.

2. Participation – Students must meet initial and response post deadlines to be eligible for full points. Late initial posts may be accepted with a 33% reduction in the overall score assessed for each day late. Two response posts are required. If only one is received, then the overall score will be reduced by 25%. If no response posts are received, then the overall score will be reduced by 50%.
3. Students should be respectful and write in a proper and professional manner.

Please refer to the Discussion Board Rubric located within course syllabus for specific requirements and guidance on delivering a substantial discussion.

### **Late and Make-up Assignments**

All deliverables are due by 11:59 PM on the due dates indicated. Assignments that are submitted after the due date without prior written approval (text or email) from the instructor will receive the following deductions:

1. Late assignments are subject to a deduction of 10% of the available points for each day late.
2. Assignments submitted later than one week after due date will not be accepted and will receive a zero (0).
3. No work may be submitted after the last day of the course.
4. See [Class Discussions](#) for late discussion post policy.

When substantive emergencies occur, acceptance of late submissions is left to the discretion of the course instructor.

### **Written Work**

- All graded assignments must be typewritten, as designated by the professor of record for the course.
- All referenced materials must be presented according to the Publication Manual of the American Psychological Association (APA), based on the most current published edition. (current, 7<sup>th</sup> edition) (Except for English courses that specify use of MLA format.)
- All required written assignments are due on the last night of each lesson week at 11:59pm EST. This information is included in the course scheduler and calendar of every course.
- All written and graded assignments are considered the property of the College of Adult and Professional Studies and should be returned to the appropriate professor of record for the related course.
- SafeAssign may be used to check for plagiarism.

### **Policies**

Academic support information is available under “CAPS Policies.”

### **Grading Scale and Assigned Letter Grades**

Charleston Southern Online Undergraduate classes follow the following numerical and letter grading scale. Grades will be posted by the Sunday night following the closing of the Module. No grades will be given to students over the phone.

A = 900 -1000 points

B+ = 870 -899 points

B = 800 – 869 points

C+ = 770 – 799 points

C = 700 – 769 points

D = 600 -699 points

F = <600 points

The following table shows the assignment types contained within this course and the assigned weighting used to determine the final course grade.

Activity Types	Weights (%)
Discussion Forums	30
Case Studies	52.5
Weekly Quiz/Test	17.5
Total	100



**Discussion Board Rubric – Introduction (First week only: 20 Points)**

Criteria	Minimal	Effective
Pts Possible: 0 or 10  Initial Post  Introduction.	Pts Possible: 0  No post or did not follow instructions at all.	Pts Possible: 10  Posted following instructions.
Pts Possible: 0 or 10  Response Posts  Welcome.	Pts Possible: 0  No post or did not follow instructions at all.	Pts Possible: 10  Posted following instructions.

Participation – Students must meet initial and response post deadlines to be eligible for full points. Late initial posts may be accepted with a 33% reduction in the overall score assessed for each day late. Two response posts are required. If only one is received, then the overall score will be reduced by 25%. If no response posts are received, then the overall score will be reduced by 50%.

**Discussion Board Rubric (40 points possible)**

Rubric Criteria	Minimal	Competent	Effective	Mastery
<i>Pts Possible: 0 - 20</i>  Initial Post  Understanding:  Discovers and conveys understanding through relevant discussion with peers. Relevant and proper business writing and critical	<i>Pts Possible: 0 - 5</i>  Student provides weak contribution to the discussion board. Addresses the questions in a manner that is unclear or does not convey concept understanding. Shows evidence of critical thought but is not concise or	<i>Pts Possible: 6 - 10</i>  Student makes contribution by making a mostly complete response to the questions. The contribution is mostly restatement of materials. Student conveys thoughts adequately; however, needs to	<i>Pts Possible: 11-15</i>  Student advances the discussion and body of knowledge providing relevant, original thoughts to the question. Student conveys thoughts in a well-rounded manner that shows understanding, critical thought and	<i>Pts Possible: 16-20</i>  Student provides relevant and thought-provoking viewpoints to the question. Post is innovative and indicates a high level of thought.  Student writing shows a high level of critical thought,

<p>thought development. Posts timely.</p> <p><i>A minimum of 2 peer-reviewed sources are cited in the post and listed in appropriate APA format at the end of the post.</i></p>	<p>complete. Does not cite any peer-reviewed sources. <i>Post is less than 75 words.</i></p> <p>0 points if post is not submitted by 11:59 p.m. on Thursday.</p>	<p>further develop critical aspects. Student cites 1 peer-reviewed source. Not in appropriate APA format. A few writing errors.</p> <p><i>Post has between 75 - 124 words.</i></p>	<p>application of concepts. Student cites 2 peer-reviewed sources in the body of the post. Not APA format.</p> <p>Well written.</p> <p><i>Post has between 125 – 250 words.</i></p>	<p>analysis and application of concepts and ideas. Student cites 2 peer-reviewed sources in the body of the post in proper APA format.</p> <p>Very well-written.</p> <p><i>Post exceeds 250 words.</i></p>
<p><i>Pts Possible: 0 - 20</i></p> <p>Response Posts</p> <p>Discovers key areas of knowledge and concepts from peers. Furthers the body of knowledge by responding to peers' posts with relevant and thought-provoking comments. <i>A minimum of 1 peer-reviewed source is cited and listed in appropriate APA format at the end of each student response.</i></p> <p>0 points = no response posts.</p> <p>10 points = 1 response post.</p>	<p><i>Pts Possible: 0 - 5</i></p> <p>Student shows minor comprehension of the concepts and viewpoints from peers. The responses are vague and do not show understanding or integration. Poorly written. Does not cite any peer-reviewed sources.</p> <p><i>Post is less than 75 words.</i></p>	<p><i>Pts Possible: 6 - 10</i></p> <p>A student shows adequate understanding of the knowledge and concepts posted by peers. The responses are mostly "I agree..."</p> <p>Student cites 1 peer-reviewed source. Peer reviewed source was somewhat relevant and published within past 5 years.</p> <p><i>Post has between 75 - 124 words.</i></p>	<p><i>Pts Possible: 11-15</i></p> <p>Student advances the discussion providing additional commentary and critique. The responses are correct but mostly restate the peers' viewpoints without development of critical thought.</p> <p>Student cites 1 peer-reviewed source. Peer reviewed source is relevant and was published within past 3 years.</p> <p><i>Post has between 125- 200 words.</i></p>	<p><i>Pts Possible: 16-20</i></p> <p>Student advances the discussion providing additional commentary that is relevant or offers an alternative. Critical thought development is evidenced by thoughtful and meaningful responses. Student cites 1 peer-reviewed source, current and relevant publication. Published within past 3 years.</p> <p><i>Each student response exceeds 200 words.</i></p>

Participation – Students must meet initial and response post deadlines to be eligible for full points. Late initial posts may be accepted with a 33% reduction in the overall score assessed for each day late. Two

response posts are required. If only one is received, then the overall score will be reduced by 25%. If no response posts are received, then the overall score will be reduced by 50%.

**Assignment/Case Study/Course Project Rubric (75 points total)**

Criteria	Minimal	Competent	Effective	Mastery
Pts Possible: 0 - 50  Critical & Clear  Addresses the Problem/Issue presented directly. Demonstrates active critical thinking relevant to problem identification and effective solutions.	Pts Possible: 0 - 12  Work did not consistently meet expectations, as significant details of the assignment are not addressed. Lacks critical thought, analysis and application.	Pts Possible: 13- 25  Comprehension is not shown consistently throughout the assignment. Marginal responses; content, concepts, ideas/responses not fully developed.	Pts Possible: 26- 39  Demonstrates satisfactory understanding but does not answer all questions/scenarios in full. Demonstrates some knowledge of the content and business vocabulary.	Pts Possible: 40- 50  Relevant use of vocabulary applied throughout the assignment. Demonstrates superior knowledge of concepts and theories.

Pts Possible: 0 – 25	Pts Possible: 0 - 9	Pts Possible: 10 - 14	Pts Possible: 15 - 19	Pts Possible: 20 - 25
<p>Properly Written</p> <p>Structure and Writing include effective use of peer-reviewed resources and APA 6<sup>th</sup> edition formatting.</p>	<p>Work does not meet expectations. Relevant critical thought/analysis is not demonstrated in the assignment. Partially addresses the topic. Does not follow APA 6<sup>th</sup> edition.</p> <p>No use of peer-reviewed resources.</p> <p>&lt;500 words</p>	<p>Comprehension is not demonstrated. Grammar/spelling errors; unorganized deliverable. Lacks focus on content. Does not follow APA 6<sup>th</sup> edition.</p> <p>Peer-reviewed resources are not current or are not effective.</p> <p>600-750 words</p>	<p>Organized deliverable, directions followed. Content needs additional focus for innovative responses other than restatement of text. Appropriate APA formatting is seen, but not extensive.</p> <p>Provides some relevant, current peer-reviewed resources.</p> <p>751-999 words</p>	<p>Relevant use of vocabulary and professional writing structure. Well-organized response of at least 1-full page that fully and completely addressed all the criteria/questions using proper APA 6<sup>th</sup> edition formatting.</p> <p>Provides appropriate, relevant and current peer-reviewed sources as directed in the assignment.</p> <p>&gt;1000 words</p>