**Instructor’s Resource Manual**

**Introduction to Data Analytics for Accounting**

Vernon J. Richardson

Katie L. Terrell

Ryan A. Teeter

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# TO THE INSTRUCTOR

This guide includes suggested assignment schedules, topical outlines, chapter comments, and suggested team exercises based on our experience teaching data analytics.

**Assignment Suggestions.** This textbook is not designed to be a survey of data analytics in accounting. Instead, it is intended to help students develop skills to support the accountant’s role as data analyst. Consequently, we recommend that assignments include the problems and labs which will help advance these skills and require critical thinking. Instructors will teach this course differently; some choosing to only use the labs or only include the text. Others may cover this textbook in eight weeks, instead of a fifteen-week period. Please note the assignment suggestions in this guide assume the material will be covered over a fifteen-week period.

**Brief Topical Outlines.** These outlines are designed to assist instructors in coordinating classroom discussions with material covered in the textbook and the PowerPoints. The brief topical outlines identify topics we believe are important to merit some classroom discussion. The outlines also include references to illustrations in the textbook, PowerPoints, questions, problems, and labs that may serve as useful supplements to your class presentations.

**PowerPoints.** The PowerPoints offer a summary of what is covered in the chapters. The topic coverage is light so you can emphasize what you like. The PowerPoints also have progress checks associated with each learning objective. Since the progress checks are meant to be reflective, we do not offer suggested answers. Hopefully they will give you opportunities to expand on the answer and generate class discussion.

**Comments and Observations.** You will probably find that our comments and observations suggest coverage of more topics than your time will allow. These are an assortment of comments we have collected over the years, so please feel free to borrow what appeals to you and discard what does not.

**Labs.** At the end of each chapter, there are labs to provide students with practice performing data analytics tools and techniques. The labs (with the exception of lab 8-2) have two datasets, one with step-by-step instructions (and video support in Connect) and a second (labeled the alt, or alternate lab), without the step-by-step instructions allowing students to demonstrate what they’ve learned on the first dataset.

Connect has multiple choice questions for both the first and alternate labs (datasets) that are autogradable. These assessments allow the instructor to determine if the labs were performed correctly. These multiple choice questions and answers are also available in the solutions manual. Connect also requests that students upload one or two screenshots as described in the lab. Please note that the screenshots are for instructor reference to dive deeper into a student’s answer, therefore are manually graded beyond submission.

Data files for each lab are included with the lab assignment in Connect. They are also accessible via the Additional Student Resource document found in the Connect Library. For instructors not using Connect, the Word doc with links to the data can be distributed to students.

**Videos.**  In today’s world, many students use visual learning tools, and many instructors teach in hybrid and online formats. So, lecture and lab videos are available to help. The videos can be assigned or simply made available to students in Connect.

**Lecture Videos –** We provide lecture videos for all chapters. We expand on the outline provided in the PowerPoints in our presentation.

**Lab Videos** – We provide videos for all labs. These include step-by-step instructions that complement the textbook instruction. We also provide explanations of why we are performing each step and how the analysis addresses the accounting questions.

**Course Description and Objectives.**

For information only, we use the following course description and objectives:

# Course Description

The combination of computerization and automation of many accounting tasks as well as the explosion of available data is changing the accounting profession. To address this, accountants are increasingly required to have an analytics mindset to perform their jobs. Building upon the fundamentals of accounting learned in prior courses, *Introduction to Data Analytics for Accounting* explores accounting concepts through the application of data analytics. We recognize students need to not only develop the skills to ask the right questions, but to learn how to use tools they may encounter in the workplace such as Excel® and Tableau® to examine and analyze data, and then effectively interpret results to make business decisions. This analytics mindset is crucial early in the study of accounting to meet the demands of today’s accounting jobs.

*Introduction to Data Analytics for Accounting* provides a framework for developing a Data Analytics mindset we refer to as the **AMPS model:**

1. **A**sk the Question (Chapter 1).

2. **M**aster the Data (Chapters 2–4).

3. **P**erform the Analysis (Chapters 5–9).

4. **S**hare the Story (Chapter 10).

This model is used throughout the text in conjunction with the various types of analysis accountants need to perform. The labs follow this framework to reinforce the analytical process. Chapter 11 acts as a capstone, providing two projects applying the complete AMPS model. The first project guides students through analyzing Lending Club loans, while the second offers the framework for students to address their own accounting question.

Vernon J. Richardson

Katie L. Terrell

Ryan A. Teeter

# A Note to Mac Users

Most of the text labs will work in Microsoft Excel or Tableau on PC as well as Mac operating systems. However, there are a few Excel labs that require additional functionality (including add-ins) that are not available on Macs, including Fuzzy Matching (Lab 7-5) and Forecasting Future Performance (Lab 8-6).

For these labs, you may choose to:

1. Skip them and focus on other labs.
2. Perform these labs on a virtual desktop that can access the appropriate software or perform them in a computer lab. (Lab 7-5 does not have an alternate software option, so a virtual desktop or lab is recommended for Mac users.)
3. Or use alternate software. In multiple labs, we perform data analysis addressing the same question in both Excel and Tableau. For example, the same time series analysis performed in Excel (Lab 8-6) can be done in Tableau (in Lab 8-7). Since Lab 8-6 requires a software add-in that is not available on the Mac, a worthy substitute is to do it in Tableau (in Lab 8-7).

# Loading Tableau Software

Tableau offers free one-year Tableau licenses to students and instructors at accredited academic institutions through their Tableau for Students program. The license will work on PCs and Macs. Here is the link for requesting a license: [https://www.tableau.com/academic/students](https://urldefense.proofpoint.com/v2/url?u=https-3A__nam05.safelinks.protection.outlook.com_-3Furl-3Dhttps-253A-252F-252Fwww.tableau.com-252Facademic-252Fstudents-26data-3D01-257C01-257Cchristina.sanders-2540mheducation.com-257Cc064ad53d4d84e08c52708d7e8619f15-257Cf919b1efc0c347358fca0928ec39d8d5-257C0-26sdata-3DIYrlWElmJSlooGQR-252FLpj-252Fllv-252F9TxpbwOjN2SjROD5ss-253D-26reserved-3D0&d=DwMFAg&c=7ypwAowFJ8v-mw8AB-SdSueVQgSDL4HiiSaLK01W8HA&r=JNww23tEgslgN6p2HYIbPkBs4uWwSudcCmu83ynSKr0&m=PCml9euKqRcRyJasapx8rIT4eYRKjd1Bd8P7kR7iLUg&s=K6J8fdbo11E_8GOU2nndEJKvKKxZRtisqcepzTh6Efw&e=). Remind your students to make sure to use their .edu email address. Tableau will use that account to verify that they are a student.

# Proposed Assignment Schedule

|  |  |  |  |
| --- | --- | --- | --- |
| **Chapter** | **Topic** | **Written Assignment (Most Brief Exercises, Problems, and Labs are also available as autograded options in Connect)** | **Objective Questions (also available as autograded in Connect)** |
| 1 | Using Accounting Data to Ask and Answer Accounting Questions | Brief Exercises 1-1, 1-3, Problems 1-1, 1-2, 1-3 | MC 1-1 to 1-10 |
| 1 | Labs (if time permits) | Lab 1-1 and 1-3 |  |
| 2 | Master the Data: An Introduction to Accounting Data | Question 2-2, 2-5  Brief Exercises 2-3, 2-4  Problems 2-1, 2-2 | MC 2-1 to 2-10 |
| 2 | Labs (if time permits) | Lab 2-1, 2-2, and 2-5 |  |
| 3 | Accounting Data: Data Types and How They are Used | Question 3-2, 3-6  Brief Exercises 3-3, 3-5  Problem 3-1 | MC 3-1 to 3-10 |
| 3 | Labs (if time permits) | Lab 3-1, 3-3 and 3-4 |  |
| 4 | Master the Data: Preparing the Data for Analysis | Question 4-1, 4-5  Brief Exercises 4-3, 4-4  Problem 4-1 | MC 4-1 to 4-10 |
| 4 | Labs (if time permits) | Lab 4-1, 4-3 and 4-5 |  |
| 5 | Perform the Analysis: Types of Analytics | Question 5-4, 5-8  Brief Exercises 5-2, 5-4  Problem 5-1, 5-2 | MC 5-1 to 5-17 |
| 5 | Labs (if time permits) | Lab 5-1 and 5-2 |  |
| 6 | Perform the Analysis: Descriptive Analytics | Question 6-1, 6-4, 6-8  Brief Exercises 6-1, 6-3  Problem 6-3, 6-4 | MC 6-1 to 6-15 |
| 6 | Labs (if time permits) | Lab 6-1 and 6-4 |  |
| 7 | Perform the Analysis: Diagnostic Analytics | Question 7-3, 7-4, 7-8  Brief Exercises 7-2, 7-4  Problem 7-3, 7-4 | MC 7-1 to 7-16 |
| 7 | Labs (if time permits) | Lab 7-4, 7-5, 7-8, 7-10 |  |
| 8 | Perform the Analysis: Predictive Analytics | Question 8-2, 8-9, 8-13  Brief Exercises 8-1, 8-2 Problem 8-2, 8-4 | MC 8-1 to 8-15 |
| 8 | Labs (if time permits) | Lab 8-1, 8-2, 8-3, 8-4, 8-5, 8-6, 8-7 |  |
| 9 | Perform the Analysis: Prescriptive Analytics | Problem 9-1, 9-2, 9-4  Brief Exercises 9-1, 9-4 Problem 9-1, 9-3 | MC 9-1 to 9-17 |
| 9 | Labs (if time permits) | Lab 9-3, 9-4, 9-7, 9-8 |  |
| 10 | Share the Story | Problem 10-2,10-3  Brief Exercises 10-2, 10-3 Problem 10-1, 10-2 | MC 10-1 to 10-10 |
| 10 | Labs (if time permits) | Lab 10-1 and 10-2 |  |
| 11 | Using the AMPS Model to put it all Together: Capstone Projects | Project 1 and/or Project 2 |  |

# PRESENTATION SUGGESTIONS

## CHAPTER 1 - Using Data Analytics to Ask and Answer Accounting Questions

**Brief Topical Outline**

A. The Changing Landscape for the Accounting Profession (PowerPoint 1-5)

1. Understanding the Scope of Big Data (PowerPoint 6-7)

2. How to deal with automation? (PowerPoints 8)

B. Adapting to the Changing World of Data Availability (PowerPoint 10)

1. Bloom’s Taxonomy (PowerPoint 11)

2. Accounting Curricula and Higher Order Thinking Skills (PowerPoint 12)

C. Introduction to the AMPS Model (PowerPoints 14)

1. The AMPS Model (PowerPoint 15)

2. Ask the Question: Accounting Questions (PowerPoints 16 – 18)

3. Master the Data (PowerPoint 19 – 20)

4. Perform the Analysis (PowerPoint 21)

5. Share the Story (PowerPoint 22)

D. Accounting Data Analytics Tools and Skills Needed (PowerPoints 24)

1. Data Analytics Tools (PowerPoint 25)

2. Accountant Tools/Skills (PowerPoints 26 – 27)

E. Chapter 1 Labs Demonstrating the AMPS Model– (PowerPoint 29)

F. Summary (PowerPoint 30)

**Comments and Observations**

Automation and the amount of data available for use in business are changing accounting. I like to talk about the amount of data provided by the financial reporting system in comparison to the data available outside of the financial reporting system. I tell them that the accounting role will change to one which uses computers to analyze data. I am finding that students understand this need, so I typically don’t have to spend much time motivating them.

I argue that data analytics, or just the act of analyzing data, is a higher-order thinking skill than the traditional undergraduate accounting education. In my view, Bloom’s Taxonomy is a good way to talk about what is needed when thinking about analyzing data. I also emphasize what tasks computers are really good at covering, and the value-add that accountants can provide above and beyond computer systems. I also state that this is where we will “operate” for this class, trying to “analyze” the data using a higher-order thinking approach than perhaps other accounting classes. While machines excel at the remembering, understanding and applying, students still need to go through all the same steps of thinking and learning to ultimately get to the analyzing, evaluating and creating where accountants must ultimately play in my opinion.

We then introduce the AMPS model as a recursive model with **A**sk the Question, **M**aster the Data, **P**erform the Analysis and **S**hare the Story. The AMPS model serves as a foundation for this book and chapter, specifically:

1. **A**sk the Question (Chapter 1).

2. **M**aster the Data (Chapters 2–4).

3. **P**erform the Analysis (Chapters 5–9).

4. **S**hare the Story (Chapter 10).

Each lab is also set up in this way, for the students to see how the process works when addressing accounting questions with accounting data. So, we spend some time talking about the AMPS model, discussing each of these steps, one by one and talk about what each step entails and why it is important.

We spend some time naming the skills needed by accountants and what we will do in the textbook to help get them there.

One of the goals of chapter 1 is for the students to open their minds and really learn what data analytics can do for accountants. I believe this chapter provides a good introduction and foundation for what will be included in the textbook to start addressing these skills.

**Suggested Team Exercise**

As a discussion of the questions that could be answered with data analytics, I have students think of the allowance for doubtful accounts (which they should remember from their intro financial class) and how we use aging analysis to estimate the amount uncollectible. Consider the following: What if we had better data on our customers, and knew if the customers had a dispute with us, are continuing to buy from us, or if they were having trouble paying other bills. Would this lead to a better estimate of which receivables are collectible and which are not? I think it is helpful for the students to meet in little groups and see if they can address that topic and then report their findings in a full class discussion.

## CHAPTER 2 - Master the Data: An Introduction to Accounting Data

**Brief Topical Outline**

A. Data, Data Analytics, and Accounting (PowerPoint 2-5)

1. Definition and Examples of Accounting Data Analytics (PowerPoints 7 – 9)

B. AMPS: Mastering the Data (PowerPoint 10)

1. The AMPS Model (PowerPoint 11 – 12)

2. Data Sources to Address Accounting Questions (PowerPoint 13)

C. What is Big Data? (PowerPoints 14 – 15)

D. Sources of Accounting Data (PowerPoints 16 – 24)

E. Sources of Accounting Data (PowerPoints 25 – 32)

F. The PivotTable: Starting to Build the Toolkit (PowerPoints 33 – 35)

F. Summary (PowerPoint 37)

**Comments and Observations**

I usually start the course discussing the Four Vs of Big Data. I define each of the Vs and then ask the students to help categorize where possible accounting and non-accounting data sources fit within context of the four Vs. I often compare stock prices with financial statements and talk about their differences. We also discuss how even though financial statements usually rank high on the veracity score, the vast majority of accounting line items involve estimates (like the net realizable value of accounts receivable, the value of inventory, property, plant and equipment, and intangible assets are significant estimates) and may not be as truthful as we think. I actually also push this a little bit and talk about political posts on Facebook that may be biased.

We next discuss accounting sources, especially those outside the traditional financial statements. For those inside the company, like the controller or internal auditors, they may have access to a host of accounting data, that outside analysts do not have. However, between the financial statements and the required SEC disclosures (if the company is required to submit these disclosures), there is plenty of data to analyze.

Students often have already forgotten that other accounting data sources like the general journal, special journal and the general ledger have rich data that can answer accounting questions. There is also a wealth of information in financial accounting-related data (including conference calls and press releases), managerial accounting-related data (including supply chain and customer-relationship management data), and tax data.

There is also a host of nonaccounting sources including a wide array of economic data, current and historical stock prices, social media and analyst reports.

I usually spend my time just describing what these are and what types of accounting questions this data might answer.

I end the class with a discussion of information overload, recognizing that with so much information available, it might make it harder to find the exact nugget of information needed. The ability to find, locate, or identify the data that is most useful will come with experience as your students become familiar with the potential data sources that might be available.

**Suggested Team Exercise**

I love posing accounting questions and asking students what data source they could go to get the answers. By now, the students should have an adequate accounting background to know which data sources have what information.

I always like the debates between students of what information is covered in which data source. It is good for students to work together to find the answers.

For example, you could ask:

* Where would you find employees on staff as of 12/1/2024 to get a bonus?
* Where would you find the timing of long-term debt payments?
* Where would you find earnings forecasts from financial analysts?
* Where would you find the GDP (gross domestic product) or job statistics of the U.S. economy in 2024?
* Where would you find the tax depreciation schedule for a factory?

## CHAPTER 3 - Accounting Data: Data Types and How They are Used

**Brief Topical Outline**

1. Introduction (PowerPoints 2 - 5)
2. Examples of Accounting Data Types (PowerPoints 6 – 11
3. Summarize Data Using PivotTables (PowerPoints 12 - 15)
4. Accounting Data, Data Types and Databases (PowerPoints 16 - 22)
5. Data Dictionaries & Data Catalogs (PowerPoints 23 - 26)
6. Summary (PowerPoint 28)

**Comments and Observations**

After intro financial and intro managerial, as well as the accounting data discussion from IDAA Chapter 2, the students are by now reasonably well-versed in accounting data. It is a powerful exercise to categorize the data type for each variety of accounting data.

I really like the example of going from an Amazon ad for a Tide Pod product, and then discussing what type of accounting, business and product data would be categorized and classified in a data dictionary or data catalog. Even looking at a press release, or a footnote to the financial statements and categorizing the data type of each potential data field is a useful exercise.

I’ve always found it useful when teaching this topic in my accounting information systems course to do this same type of exercise for a student database file, detailing the fields of information on each student that a university might maintain. Students enjoy creatively thinking what data is necessary and then helping to categorize each field. Even though this isn’t directly accounting data, I believe it helps get the student prepared for the discussion of the accounting data types.

**Suggested Team Exercise**

Good class exercises might be going to a Walmart.com listing of a product and asking a group to perform a similar exercise. Or even accessing an example of a master employee file or customer file and discussing the types of data from each data field. Individuals could do this separately, then discuss in a group and finally share or compare in kind of a think-pair-share format.

## CHAPTER 4 Master the Data: Preparing the Data for Analysis

**Brief Topical Outline**

1. Introduction (PowerPoints 2 – 5)
2. The Differences Among a Database, Excel and Tableau (PowerPoint 6 - 7)
3. Relational Databases (PowerPoint 8 - 12)
4. Relational Databases, Data Dictionaries and ER Diagrams (PowerPoints 13 – 16)
5. The Benefits of Relational Databases (PowerPoints 17 – 20)
6. Connecting to Data in Excel and Tableau (PowerPoints 21 - 25)
7. Extracting Data from External Databases (PowerPoints 26 - 31)
8. Summary (PowerPoint 4-33)

**Comments and Observations**

As part of mastering the data, the “M” in our AMPS model, it is critical that students understand how the data is usually stored in relational databases. I define a relational database, and the necessity of a unique identifier (primary key) and how foreign keys are used to “connect” or “join” one database to another. We explain how ER diagrams and data dictionaries explain the connections to the different datasets. I explain the internal control benefits and the enhanced data integrity as some of the advantages of relational databases over alternate forms of database organization.

Once relational databases are defined, discuss various ways to extract the data from a relational database using structured query language. SQL and VLOOKUP can both be employed within excel to extract data out of other Excel worksheets or larger relational databases. Excellent examples of these are shown in the labs at the end of the chapter. We highlight labs 4-1, 4-3 and 4-5 as a representative set of the various tools employed in Excel and Tableau.

**Suggested Team Exercise**

Once the basics have been covered in class, it is sometimes useful to talk through the various join types, asking students to detail how they would link tables to each other. They could do this in a group setting, first thinking about how it would be done individually and then getting together in a group to compare solutions. Tableau offers the most intuitive tool to figure out the possible join types and experiment with their implementation.

## CHAPTER 5 – Perform the Analysis: Types and Tools of Data Analyses

**Brief Topical Outline**

1. Introduction (PowerPoints 1 - 6)
2. Matching the Analytics with the Question (PowerPoint 7 – 14)
3. Descriptive Analytics (PowerPoints 15 – 22)
4. Diagnostic Analytics (PowerPoints 23 – 28)
5. Predictive Analytics (PowerPoints 29 – 32)
6. Prescriptive Analytics (PowerPoints 33 – 38)
7. Review of Basic Statistics (PowerPoints 39 – 51)
8. Excel’s Data Analysis Toolpak (PowerPoint 52 – 55)
9. Summary (PowerPoints 40 – 41)

**Comments and Observations**

The third component of the AMPS model is “P” for Perform the Analysis. I use Chapter 5 as a set up for Chapters 6 – 9 just discussing the different types of questions, and then matching that to the analytics we can perform. After reviewing the basics of each type of analytics, I like coming up with a diverse set of accounting questions and then asking the students to identify the right type of analytics. I do this at the beginning of the lecture and then again towards the end to see if they understand the difference among the types of analytics and the questions they address.

I talk in some detail about the types of analytics and the tools that are employed. I try to provide lots of examples and lots of questions as I go. Once they understand the type of analytics employed, I like to go in more detail talking about the tools used. This gives a natural lead in to the discussion on statistics and the use of Excel’s Data Analysis Toolpak.

The level of statistics taught really depends on 1) whether the students have taken a business stats course 2) how long ago it was taken and 3) whether you are able to convince the students they still remember some of it. There is not a lot of statistics in this course, but I think it is good to reinforce what the students have already learned with some very applied examples. It never hurts to start by defining a few terms, explaining the differences between a population and a sample; a parameter and a statistic; and distributions--emphasizing the normal distribution. I personally feel students cannot get too much statistics discussion, but the real question is whether to do it with the general discussion or as the labs are completed and analyzed. The level and depth of the statistics discussion really depends on the level of statistics the students have already had.

Finally, we introduce the Excel Data Analysis Toolpak. I show students how to load it and then show a few basics of what the add-in can do in Labs 5-1 and 5-2.

**Suggested Team Exercise**

One idea for a team exercise is to discuss hypothesis testing.

1. I have individuals formulate different hypotheses, perhaps around which types of companies have the highest stock return, which type of employees get paid the most, or which types of items are returned after the holidays.
2. Then in the spirit of pair, share, compare, I have them formulate null and alternate hypotheses in a group of 2-3 people.
3. I then ask them to nominate one of their hypotheses for class discussion. I then work with them to ask how it would be tested statistically to know whether one outcome was shown statistically over another outcome.
4. I believe this leads to a good discussion of hypotheses formulation, hypotheses testing and the appropriate tests and statistics to use.

## CHAPTER 6 – Perform the Analysis: Descriptive Analytics

**Brief Topical Outline**

* 1. Introduction (PowerPoints 2 – 5)
  2. Defining Descriptive Analytics (PowerPoints 6 - 8)
  3. Accounting Data, Tools and Techniques Used in Descriptive Analytics (PowerPoint 9 – 13))
  4. Examples of Descriptive Analytics (PowerPoints 14 - 19)
  5. Using Horizontal, Vertical and Dupont Analyses as Descriptive Analytics (PowerPoints 20 - 29)
  6. Descriptive Analytics as the First Step in Additional Analyses (PowerPoints 30 - 35)
  7. Summary (PowerPoint 36)

**Comments and Observations**

I’ve always believed that the best descriptive analytics explaining, “What is happening?”, or “What happened?” are both encapsulated in the financial statements. Of course, there are many other different ways to summarize “What is happening?”, or “What happened?”

I also like discussing all of the tools and techniques that can be used. Essentially it is every descriptive statistic ever invented between means, medians, modes, mins, maxes, counts, range, standard deviation, pivottables, crosstabulation, histograms, bar and line charts, and percentage changes seem to round out the lot. I like giving a question that merits descriptive analytics and asking which tool would address that question the best. It leads to pretty good class discussion.

We then move to specific questions that can be answered using pivottables and pivot charts. I explain the usefulness of bar charts and line charts to quickly show “what happened” recently in relation to events shown in the charts.

Horizontal, vertical and DuPont analysis are also useful techniques to demonstrate change that might lead to additional questions that may be needed to address why something happened in the next type of diagnostic analytics. I like building bridges from one type of analytics to another, to kind of smooth out the analysis and make continuous instead of being so chunky.

One of the most famous graphs in financial accounting research is the Burgstahler and Dichev. I like this graphic because it is meant to answer, “What happens?”, but really prompts more questions to answer why, which is a good lead into diagnostic analytics which we’ll cover in Chapter 7.

**Suggested Team Exercise**

In a group setting, individual students could ask accounting questions that are answerable with descriptive analytics.

Perhaps they could use the questions that require descriptive analytics from Chapter 5 and 6, and then ask each other which data and which tool would most be able to answer the question of “What is Happening?”. Should we use measures of central tendency, counts, crosstabulations or a graph, etc.?

I also enjoy doing labs in class, especially ones that are not covered in the homework. This will help them gain confidence in their work and make them ready for the labs they are about to do as homework.

## CHAPTER 7 – Perform the Analysis: Diagnostic Analytics

**Brief Topical Outline**

1. Introduction (PowerPoints 1 - 5)
2. Defining Diagnostic Analytics (PowerPoints 6 – 8)
3. Identifying Anomalies and Outliers (PowerPoints 9 to 22)
4. Finding Previously Unknown Linkages, Patterns, or Relationships Between and Among Variables (PowerPoints 23 – 26)
5. Hypothesis Testing (PowerPoints 27 - 31)
6. Summary (PowerPoint 32)

**Comments and Observations**

This is a fun chapter for me. I start off talking about the management practice of “management by exception”. That is, as long as everything is pretty much what we expect, no big deal. But once we identify an anomaly or outlier, that is what we investigate further. After talking through the expectations of an investor, a manager (or management accountant), an auditor, or a tax accountant, it is easy to see how exceptions occur that might result in an anomaly or outlier. Price, rate, volume variances from managerial accounting are a natural source of anomalies. So are bank reconciliations – they are reconciling items because they don’t match the cash transactions between the bank statement and the general ledger.

Two analytic tests I emphasize are Benford’s Law and fuzzy matching. I like to show an illustration of Benford’s Law using populations of countries of the world. We go through the same steps as the lab related to Benford’s Law, but students are able to see its application in settings outside of accounting.

For fuzzy matching, I like setting the similarity thresholds really high and then really low to talk about type 1 and type 2 errors in terms of finding potentially fraudulent cases where an employee and a fake vendor might have a similar address. Would you rather have false positives or false negatives? Which is more costly in terms of fuzzy matching?

I like to talk about Moneyball, the movie starring Brad Pitt, based on the true story of Billy Beane and Peter Brand of the Oakland A’s using data analytics to identify undervalued talent at the Oakland A’s during the 2002 baseball season. That leads into a good discussion of how data analytics might be used to find patterns or relationships between and among variables.

I like demonstrating hypothesis testing using a difference in means and regression analysis for the analysis of sales returns, the analysis of the effect of advertising on sales and the difference in stock returns between different company’s stock. I emphasize that we are answering the “Why did this happen?” question and try to explain why this fits within diagnostic analytics.

**Suggested Team Exercise**

Assign questions like those listed below to groups, then have them present their results in class.

* If you were to use data analytics to predict the best professor, what type of analysis would you use?
* If you were to use data analytics to predict the best performing company, what type of analysis would you use?
* How would you explain if taxable income went up, when financial income went down?
* How would you find fraud of an inappropriate relationship between an accounts payable clerk and a company vendor? What type of analytics would you use? How could you possibly find fraud?
* Why would reconciling items in a bank reconciliation represent an anomaly or outlier?

Push them a little bit so they don’t just give the easy answer, but answer it to a fuller extent. Remember we’re trying to give them to the analysis skills in Blooms’ taxonomy, and this is one place we can do just that!

## CHAPTER 8 – Perform the Analysis: Predictive Analytics

**Brief Topical Outline**

1. Introduction (PowerPoints 2 - 5)
2. Defining Predictive Analytics (PowerPoints 6 - 10)
3. Classification (PowerPoints 11 - 24)
4. Regression (PowerPoints 25 - 30)
5. Base Rates and Base Rate Fallacy (PowerPoints 31 - 34)
6. Time Series Analysis (PowerPoints 35 - 41)
7. Hypothesis Testing (PowerPoints 42 - 46)
8. Machine Learning (PowerPoints 47 - 48)
9. Summary (PowerPoint 50)

**Comments and Observations**

There are so many things to talk about in this chapter. It is my favorite, mostly because I believe it is full of very relevant accounting examples. I believe our traditional accounting education does a good job of measuring the past, but does not necessarily do a very good job of predicting the future. I think that starts to change with this chapter.

It is important to emphasize the difference between classification and regression. Explore the difference between of analyzing a few outcomes (or classes) and many possible outcomes. I spend time on each classification, why it involves groups or classes and why they are relevant accounting questions. Why predict bankruptcy? Because it is important for financial statement analysis. Why predict misstatements? Because it is exactly what auditors are looking for, financial statements that do not conform with GAAP. These are critical accounting questions!

The same thing with regression analysis. In managerial accounting, instructors often give students the names of the cost drivers. But in this class, we use regression analysis to see which variables are most associated with overhead cost and then use that to allocate overhead.

I also enjoy covering time series analysis. I like emphasizing the persistence graphic to really talk about sales, operating income and cash flows. I also emphasize why GAAP uses accrual measures for its computation of net income as opposed to cash flows measures, simply because they are more persistent, which is great in a time series analysis!

**Suggested Team Exercise**

I like looking at each of the five factors of Altman’s Z and asking groups to comment on what they feel is the most important factor. I also ask if they could add a sixth factor, what would it be? This brings many interesting comments and gets students “acting” rather being “acted upon” to promote active learning!

I also like predicting loan acceptance. Before opening up lab 8-2 or introducing it in class, I ask students, how they would predict whether a loan would ultimately get paid? If they could use any variable in the world, how could it predict whether a loan would pay back? This works particularly well in a group, leading to a nice discussion when given a few minutes to figure it out.

These team exercises work well with most of the labs. (I.e. have them name what might help most in a prediction.)

## CHAPTER 9 – Perform the Analysis: Prescriptive Analytics

**Brief Topical Outline**

1. Introduction (PowerPoints 2 - 5)
2. Defining Prescriptive Analytics (PowerPoints 6 - 11)
3. What-If Sensitivity Analysis (PowerPoints 12 - 14)
4. Evaluating Future Cash Flows (PowerPoints 15 - 22)
5. Marginal (or Incremental) Analysis (PowerPoints 23 - 28)
6. Goal-Seek Analysis (PowerPoints 29 - 32)
7. What-If Scenario Analysis (PowerPoints 33 - 44)
8. Summary (PowerPoint 45)

**Comments and Observations**

In this chapter I emphasize that prescriptive analytics is the next step after predictive analytics. They both work to forecast the future, but prescriptive analytics works to make recommendations on what needs to be done based on what we expect will happen.

I like emphasizing constraints, which gives rise to optimization, and that changing conditions make it necessary to update data on a continual basis.

Sensitivity analysis recognizes that input prices, such as interest rates, exchange rates and petroleum costs, may keep changing. We need to know how our outcomes and our decision making might change based on how sensitive the outputs are to the various and changing inputs.

I am a finance guy at heart, so I always enjoy the evaluation of future cash flows, both IRR and NPV. Determining the amounts, timing and uncertainty of future cash flows and its effect on the evaluation of investments and capital projects is something that really interests me, so I spend a lot of time here. I like looking at investments that look like they are going to pay off in a similar way, but then examine how the time value of money and the evaluation of risk included in the discount rate might affect it.

There are several other types of analysis. The one that I think students enjoy is using the goal-seek analysis for breakeven analysis, or analysis of getting the lowest possible grade on the final and still getting an “A” grade in the class.

**Suggested Team Exercise**

I like discussing make-or-buy analysis, especially the non-financial implications that should be considered. I consider myself to have a fairly strong general business background, so I spend quite a bit of time talking about strategic items, like core competencies and competitive advantage and what might happen on a nonfinancial basis if we decide to make or buy (outsource), etc.

If you work to find an area that students might be particularly interested in, they will pair off into groups and come up with a bunch of strategic implications that really build up the learning associated with prescriptive analytics.

## CHAPTER 10 – Share the Story

**Brief Topical Outline**

1. Introduction (PowerPoints 2 - 5)
2. The Basics of Data Visualization (PowerPoints 6 - 10)
3. Visualizing Descriptive Statistics and Analytics (PowerPoints 11 - 20)
4. Visualizing Diagnostic Statistics and Analytics (PowerPoints 21 - 25)
5. Visualizing Predictive Statistics and Analytics (PowerPoints 26 - 30)
6. Visualizing Prescriptive Statistics and Analytics (PowerPoints 31 - 34)
7. Summary (PowerPoint 36)

**Comments and Observations**

Some visualizations are part of the analysis, like finding outliers in diagnostic analysis. Other visualizations are meant to “share the final story”. Since the book in many ways revolves around the different types of analytics, we have chosen to structure the chapter around the four analytics types.

I think it is smart to reflect again about the question that each type of analytics is attempting to answer. That will often help determine the type of visualizations best suited to provide an answer to that question whether it be in helping perform the analysis or sharing the final story.

For example, as part of diagnostic analytics, we could run the statistics to find out whether the distribution of numbers departs from that expected by Benford’s Law. Providing a graph really helps point out possible differences.

In time series analysis, we could run the analysis to provide the prediction as a single number, or we could view the full time series with expected performance and confidence intervals to tell the whole story. Is this the analysis, or is this sharing the story? I think the answer is potentially both.

Students could likewise practice doing an executive summary of a company’s annual report (using the chapter guidelines). What information would be emphasized? How would it be summarized?

**Suggested Team Exercise**

Pass out 4-5 visualizations, from anywhere in the book or a research setting and ask each group:

1. To determine what type of analytics it refers to.
2. To determine if the visualization is part of “Performing the Analysis” or “Sharing the Story” or both.
3. Ideas on how the visualization could be improved.

## CHAPTER 11 – Using the AMPS Model to Put it All Together: Capstone Projects

**Brief Topical Outline**

1. Introduction (PowerPoints 2 to 6)
2. Project 1: Using the AMPS Model To Address the Question of Loan Repayment (PowerPoints 7 to 13)
3. Project 2: Completing Your Own Project Using the AMPS Model (PowerPoints 14 to 18)

**Comments and Observations**

This chapter is intended as a capstone to the course, to let the students go through the entire data analysis process, start to finish. The idea is that the students operationalize the AMPS model by asking the question, finding and mastering the data, performing the analysis and sharing the story.

The first project has a lot of handholding since we ask the question and give them the data, suggest different analyses and discuss how to write the report. For some classes, this is the best you can do. But for others, perhaps this first project can be done in preparation for the second project, where students do the full AMPS model on their own.

The more you are able to use a hands-off approach on this first project, the more likely the students will work to solve their issues and think on their own.

The second project is much more hands off. I have milestones during the semester where the students propose their project, then come visit me about what they plan to do, then ask for a second enhanced proposal, and so on until the project is complete.

**Suggested Team Exercise**

I often ask the students to do these final 1-2 projects in groups, though I also find value in having them do them individually. I have tried and like the idea of having students do the first project individually and then doing the second project in groups of one or two.

# LABS

At the end of each chapter a collection of labs is included that allow students to apply specific steps of the AMPS model to a variety of data problems with different datasets. There are a variety of paths that can be taken with assigning the labs. Each lab can be done independent of the labs that precede it, although there are some labs that provide a richer student experience if they are done in sequence.

The end-of-chapter labs can each be completed on the students’ local computers or on the local computer in your computer lab.

If time permits, I have the students do all of the labs in the book. I do some in class, but mostly I assign outside of class. Students are usually eager to do them, and they really aren’t that hard. Videos for all of the labs are also available on Connect, so if the students have problems, they can use the videos to help them.

The next page contains a detailed listing of each lab in the textbook including required software (Excel or Tableau), time to complete, difficulty, as well as the appropriate referent accounting course where the specific content belongs.

## Detailed Lab Breakdown By Tool, Difficulty and Referent Accounting Course

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Lab Number** | **Title** | **Tool** | **Function** | **Difficulty** | **Time** | **Intro Fin** | **Intro Man** | **Cost** | **Audit** | **Inter- mediate** | **AIS** | **Tax** | **FSA** |
| 1-1 | Journal Entries to Trial Balance | Excel | PivotTable | Easy | 30 | x |  |  |  |  |  |  |  |
| 1-2 | Depreciation using Excel Functions | Excel | SLN(), DDB(), SYD() | Easy | 25 | x |  |  |  | x |  |  |  |
| 1-3 | Creating a Mortgage Amortization Schedule | Excel | PMT() | Medium | 40 | x |  |  |  | x |  |  |  |
| 2-1 | Accounts Receivable Summary by Customer | Excel | PivotTable | Easy | 30 | x |  |  | x | x |  |  |  |
| 2-2 | Accounts Receivable Summary by Customer | Tableau | Tableau | Easy | 30 | x |  |  | x | x |  |  |  |
| 2-3 | Inventory Management by Customer Profitability | Excel | PivotTable | Medium | 30 |  | x | x |  |  |  |  |  |
| 2-4 | Inventory Management by Customer Profitability | Tableau | Tableau | Medium | 30 |  | x | x |  |  |  |  |  |
| 2-5 | Inventory Management by SKU Profitability | Excel | Histogram, PivotTable | Medium | 30 |  | x | x |  |  |  |  |  |
| 2-6 | Inventory Management by SKU Profitability | Tableau | Tableau | Medium | 30 |  | x | x |  |  |  |  |  |
| 3-1 | Identify and Work with Different Data Types (Excel) | Excel | PivotTable | Easy | 20 |  |  |  |  |  | x |  |  |
| 3-2 | Identify and Work with Different Data Types (Tableau) | Tableau | Tableau | Medium | 20 |  |  |  |  |  | x |  |  |
| 3-3 | Visualize Different Data Types | Tableau | Tableau | Medium | 20 |  | x |  |  |  | x |  |  |
| 3-4 | Aggregate and Visualize Different Data Types (Excel) | Excel | Graphing | Medium | 35 |  | x |  | x |  |  |  |  |
| 4-1 | Working with Data in Excel: Ranges, Tables and PivotTables | Excel | PivotTable | Medium | 30 |  |  | x |  |  | x |  |  |
| 4-2 | Linking Two Tables Using VLOOKUP for State Tax Rates | Excel | VLOOKUP | Medium | 25 |  |  |  |  |  |  | x |  |
| 4-3 | Linking Two Tables Using VLOOKUP for Relational Data in Excel | Excel | VLOOKUP | Medium | 25 |  |  |  | x |  | x |  |  |
| 4-4 | Linking Tables in Excel using the Internal Data Model | Excel | Data Model | Hard | 30 |  |  |  | x |  | x |  |  |
| 4-5 | Linking Tables in Tableau using Different Join Methods | Tableau | Data Model | Hard | 30 |  |  |  | x |  | x |  |  |
| 5-1 | Descriptive Statistics for the Retail Industry | Excel | Descriptive Statistics | Easy | 20 |  |  |  |  | x |  |  |  |
| 5-2 | Using Conditional Formatting to Perform Bank Reconciliations | Excel | Conditional Formatting | Easy | 25 | x |  |  |  | x |  |  |  |
| 6-1 | Aging Receivables (Excel) | Excel | PivotTable, Pivot Chart | Medium | 35 | x |  |  |  | x |  |  |  |
| 6-2 | Aging Receivables (Tableau) | Tableau | Tableau | Medium | 35 | x |  |  |  | x |  |  |  |
| 6-3 | Horizontal Analysis with Sparklines | Excel | % Change, Sparklines | Easy | 30 | x |  |  |  | x |  |  |  |
| 6-4 | Vertical Analysis with Sparklines | Excel | % Change | Medium | 30 | x |  |  |  | x |  |  |  |
| 6-5 | DuPont Analysis | Excel | % Change | Medium | 30 | x |  |  |  | x |  |  |  |

## Detailed Lab Breakdown By Tool, Difficulty and Referent Accounting Course (cont.)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Lab Number** | **Title** | **Tool** | **Function** | **Difficulty** | **Time** | **Intro Fin** | **Intro Man** | **Cost** | **Audit** | **Inter- mediate** | **AIS** | **Tax** | **FSA** |
| 7-1 | Test of Separation of Duties | Excel | PivotTable | Easy | 30 |  |  |  | x |  |  |  |  |
| 7-2 | Days of the Week Journal Transactions | Excel | VLOOKUP() | Medium | 40 |  |  |  | x |  |  |  |  |
| 7-3 | Using the Match() Function to Perform Bank Reconciliations | Excel | MATCH() | Medium | 30 |  |  |  | x |  |  |  |  |
| 7-4 | Benford's Law | Excel | LEFT(), Chi-square test | Hard | 40 |  |  |  | x | x |  |  |  |
| 7-5 | Fuzzy Matching and Fake Employees/Vendors | Excel | Fuzzy Matching | Medium | 40 |  |  |  | x | x |  |  |  |
| 7-6 | Sequence Check Analysis using Conditional Formatting | Excel | Sequence check | Medium | 30 |  |  |  | x |  |  |  |  |
| 7-7 | Duplicate Payments | Excel | MATCH() | Medium | 25 |  |  |  | x |  |  |  |  |
| 7-8 | Looking for Fraud by Examining Relationships within a Data File: Accounts Payable Clerks and Company Vendors (Excel) | Excel | PivotTables | Medium | 40 |  |  |  | x |  |  |  |  |
| 7-9 | Looking for Fraud by Examining Relationships within a Data File: Accounts Payable Clerks and Company Vendors (Tableau) | Tableau | Tableau | Medium | 40 |  |  |  | x |  |  |  |  |
| 7-10 | Evaluating the Relationship between Sales and Advertising Expense | Excel | Regression | Medium | 40 |  |  | x |  | x |  |  | x |
| 8-1 | Classifying Bankruptcy Using Altman's Z | Excel | Regression | Medium | 50 |  |  |  |  | x |  |  |  |
| 8-2 | Classifying Loan Acceptance using Lending Club Data | Excel | Classification | Medium | 30 |  |  |  |  | x |  |  |  |
| 8-3 | Estimating Cost Behavior Using Regression Analysis | Excel | Regression | Medium | 45 |  |  | x |  |  |  |  |  |
| 8-4 | Estimating Activity Based Costing Drivers using Regression Analysis | Excel | Regression | Hard | 70 |  |  | x |  |  |  |  |  |
| 8-5 | Estimating Borrower Interest Rates using Regression Analysis using Lending Club Data | Excel | Regression | Hard | 50 |  |  |  |  | x |  |  |  |
| 8-6 | Forecasting Future Performance (Sales and Earnings for IBM and Microsoft) - Excel | Excel | Forecast Sheet | Medium | 30 |  |  | x |  | x |  |  | x |
| 8-7 | Forecasting Future Performance (Sales and Earnings for IBM and Microsoft) - Tableau | Tableau | Tableau | Medium | 30 |  |  | x |  | x |  |  | x |
| 8-8 | Cash-Basis and Accrual-Basis Net Income and Market Value Prediction | Excel | Regression | Medium | 40 |  |  |  |  |  |  |  | x |
| 9-1 | Lump Sum or Annuity? | Excel | NPV() | Medium | 30 |  |  |  |  | x |  |  |  |
| 9-2 | Evaluating Investments using NPV | Excel | NPV() | Easy | 40 |  |  |  |  | x |  |  |  |
| 9-3 | Capital Budgeting Using NPV | Excel | NPV() | Easy | 40 |  |  |  |  | x |  |  |  |
| 9-4 | Evaluating Investments using IRR | Excel | IRR() | Easy | 40 |  |  |  |  | x |  |  |  |
| 9-5 | Capital Budgeting Using IRR | Excel | IRR() | Easy | 40 |  |  |  |  | x |  |  |  |
| 9-6 | Face, Discount or Premium? | Excel | NPV() | Medium | 30 |  |  |  |  | x |  |  |  |
| 9-7 | What If Solver/Breakeven/Goal Seek | Excel | What-if Solver | Medium | 25 |  | x | x |  |  |  |  |  |
| 9-8 | What If Solver/Final Exam Grade/Goal Seek | Excel | What-if Solver | Medium | 25 |  | x | x |  |  |  |  |  |
| 9-9 | What If Scenario/Tax Rates | Excel | XBRL | Medium | 40 |  |  |  |  |  |  | x |  |
| 10-1 | Create a Dashboard in Excel Using PivotTables and Slicers | Excel | PivotTables, Slicers | Medium | 40 |  |  | x |  |  |  |  |  |
| 10-2 | Creating a Dashboard Using Tableau | Tableau | Tableau | Medium | 40 |  |  | x |  |  |  |  |  |