

8th Edition

Financial Analysis with Microsoft® Excel® 2016

Timothy R. Mayes

Financial Analysis with Microsoft[®] Excel[®]

EIGHTH EDITION

Timothy R. Mayes

Metropolitan State College of Denver



Australia • Brazil • Mexico • Singapore • United Kingdom • United States



Financial Analysis with Microsoft® Excel®,
Eighth Edition

Timothy R. Mayes

SVP, GM Social Science and Qualitative Business:
Erin Joyner

Executive Product Director: Mike Schenk

Sr. Product Team Manager: Joe Sabatino

Project Manager: Julie Dierig

Content Developer: Tara Slagle,
MPS North America LLC

Product Assistant: Renee Schnee

Sr. Marketing Manager: Nate Anderson

Manufacturing Planner: Kevin Kluck

Intellectual Property Analysts: Brittani Morgan and
Ashley Maynard

Intellectual Property Project Manager:
Kathryn Kucharek

Art and Cover Direction, Production Management,
and Composition: Lumina Datamatics Inc.

Sr. Art Director: Michelle Kunkler

Cover Image: Cover Screenshots are used with
permission from Microsoft Corporation,
Microsoft Excel® is a registered trademark
of Microsoft Corporation.

© 2016 Microsoft.

© 2018, 2015 Cengage Learning®

Unless otherwise noted, all content is © Cengage

Microsoft Excel: Microsoft Excel is a registered trademark of Microsoft Corporation. 2014 Microsoft

ALL RIGHTS RESERVED. No part of this work covered by the copyright herein may be reproduced or distributed in any form or by any means, except as permitted by U.S. copyright law, without the prior written permission of the copyright owner.

For product information and technology assistance, contact us at
Cengage Learning Customer & Sales Support, 1-800-354-9706.

For permission to use material from this text or product,
submit all requests online at **www.cengage.com/permissions**.
Further permissions questions can be emailed to
permissionrequest@cengage.com.

Library of Congress Control Number: 2017934413

ISBN: 978-1-337-29804-9

Cengage Learning

20 Channel Center Street

Boston, MA 02210

USA

Cengage Learning is a leading provider of customized learning solutions with employees residing in nearly 40 different countries and sales in more than 125 countries around the world. Find your local representative at

www.cengage.com/global

Cengage Learning products are represented in Canada by
Nelson Education, Ltd.

To learn more about Cengage Learning Solutions, visit
www.cengage.com.

Purchase any of our products at your local college store or at our preferred online store **www.cengagebrain.com**.

Contents

Preface **xiii**

Purpose of the Book **xiv**

Target Audience **xiv**

A Note to Students **xv**

Organization of the Book **xv**

Outstanding Features **xvi**

Pedagogical Features **xvii**

Supplements **xvii**

Typography Conventions **xviii**

Changes from the 7th Edition **xix**

A Note on the Internet **xix**

Acknowledgments **xx**

CHAPTER 1 *Introduction to Excel 2016* **1**

Spreadsheet Uses **2**

Starting Microsoft Excel **2**

Parts of the Excel Screen **3**

The File Tab and Quick Access Toolbar **3**

The Home Tab **4**

The Formula Bar **6**

The Worksheet Area **6**

Sheet Tabs **7**

Status Bar **7**

Navigating the Worksheet **8**

Selecting a Range of Cells **9**

Using Defined Names **9**

Entering Text and Numbers **10**

Formatting and Alignment Options **11**

Formatting Numbers **13**

Adding Borders and Shading **14**

Entering Formulas **14**

Copying and Moving Formulas **17**

Mathematical Operators **18**

Parentheses and the Order of Operations **18**

Using Excel's Built-In Functions	20
<i>Using the Insert Function Dialog Box</i>	21
<i>"Dot Functions" in Excel 2016</i>	23
<i>Using User-Defined Functions</i>	24
Creating Graphics	26
<i>Creating Charts in a Chart Sheet</i>	26
<i>Creating Embedded Charts</i>	27
<i>Formatting Charts</i>	28
<i>Changing the Chart Type</i>	29
<i>Creating Sparkline Charts</i>	31
Printing	32
Using Excel with Other Applications	33
Quitting Excel	34
Best Practices for Spreadsheet Models	35
Summary	36
Problems	37
Internet Exercise	40

CHAPTER 2 *The Basic Financial Statements* **41**

The Income Statement	42
<i>Building an Income Statement in Excel</i>	42
The Balance Sheet	47
<i>Building a Balance Sheet in Excel</i>	47
Improving Readability: Custom Number Formats	49
Common-Size Financial Statements	52
<i>Creating Common-Size Income Statements</i>	52
<i>Creating a Common-Size Balance Sheet</i>	54
Building a Statement of Cash Flows	55
<i>Using Excel's Outliner</i>	60
<i>Common-Size Statement of Cash Flows</i>	62
Summary	65
Problems	66
Internet Exercise	68

CHAPTER 3 *Financial Statement Analysis Tools* **69**

Liquidity Ratios	70
<i>The Current Ratio</i>	71
<i>The Quick Ratio</i>	72

Efficiency Ratios	73
<i>Inventory Turnover Ratio</i>	73
<i>Accounts Receivable Turnover Ratio</i>	74
<i>Average Collection Period</i>	74
<i>Fixed Asset Turnover Ratio</i>	75
<i>Total Asset Turnover Ratio</i>	76
Leverage Ratios	77
<i>The Total Debt Ratio</i>	77
<i>The Long-Term Debt Ratio</i>	78
<i>The Long-Term Debt to Total Capitalization Ratio</i>	78
<i>The Debt to Equity Ratio</i>	79
<i>The Long-Term Debt to Equity Ratio</i>	80
Coverage Ratios	80
<i>The Times Interest Earned Ratio</i>	80
<i>The Cash Coverage Ratio</i>	81
Profitability Ratios	82
<i>The Gross Profit Margin</i>	82
<i>The Operating Profit Margin</i>	83
<i>The Net Profit Margin</i>	83
<i>Return on Total Assets</i>	84
<i>Return on Equity</i>	84
<i>Return on Common Equity</i>	85
<i>DuPont Analysis</i>	85
<i>Analysis of EPI's Profitability Ratios</i>	87
Financial Distress Prediction	88
<i>The Original Z-Score Model</i>	88
<i>The Z-Score Model for Private Firms</i>	90
Using Financial Ratios	90
<i>Trend Analysis</i>	90
<i>Comparing to Industry Averages</i>	91
<i>Company Goals and Debt Covenants</i>	93
<i>Automating Ratio Analysis</i>	93
Economic Profit Measures of Performance	95
Summary	98
Problems	101
Internet Exercise	102

CHAPTER 4 *The Cash Budget* **103**

The Worksheet Area	105
<i>Using Date Functions</i>	105

Calculating Text Strings 106

Sales and Collections 107

Purchases and Payments 109

Collections and Disbursements 110

Calculating the Ending Cash Balance 112

Repaying Short-Term Borrowing 114

Using the Cash Budget for What-If Analysis 115

The Scenario Manager 117

Adding Interest and Investment of Excess Cash 121

Calculating Current Borrowing 123

Using the Formula Auditing Tools to Avoid Errors 123

Calculating Current Investing 127

Working Through the Example 128

Summary 131

Problems 133

CHAPTER 5 *Financial Statement Forecasting* 139

The Percent of Sales Method 140

Forecasting the Income Statement 140

Forecasting Assets on the Balance Sheet 144

Forecasting Liabilities on the Balance Sheet 146

Discretionary Financing Needed 147

Using Iteration to Eliminate DFN 149

Other Forecasting Methods 152

Linear Trend Extrapolation 152

Regression Analysis 156

Statistical Significance 160

Summary 163

Problems 164

Internet Exercises 166

CHAPTER 6 *Forecasting Sales with Time Series Methods* 167

Time Series Decomposition 168

Smoothing a Time Series with Moving Averages 169

Isolating the Seasonality of a Time Series 171

Extracting the Irregular Component 172

Time Series Forecasting Techniques 173

Measuring Forecast Errors 174

Exponential Smoothing Methods 174

<i>Simple Exponential Smoothing</i>	175
<i>Holt's Linear Trend Exponential Smoothing Model</i>	177
<i>Forecasting Time Series with Both Trend and Seasonality</i>	179
<i>Holt-Winters Additive Seasonal Model</i>	180
<i>Using the Built-in ETS Model</i>	182
<i>Holt-Winters Multiplicative Seasonal Model</i>	184
Time Series Forecasting Using Regression Analysis	186
<i>Forecasting the Trend Using Regression</i>	186
<i>Using Seasonal Dummy Variables to Account for Seasonality</i>	188
Summary	191
Problems	192
Internet Exercise	193

CHAPTER 7 *Break-Even and Leverage Analysis* 195

Break-Even Points	196
<i>Calculating Break-Even Points in Excel</i>	197
<i>Other Break-Even Points</i>	199
Using Goal Seek to Calculate Break-Even Points	201
Leverage Analysis	202
<i>The Degree of Operating Leverage</i>	203
<i>The Degree of Financial Leverage</i>	205
<i>The Degree of Combined Leverage</i>	207
<i>Extending the Example</i>	208
Linking Break-Even Points and Leverage Measures	209
Summary	210
Problems	212
Internet Exercise	213

CHAPTER 8 *The Time Value of Money* 215

Future Value	216
<i>Using Excel to Find Future Values</i>	217
Present Value	218
Annuities	219
<i>Present Value of an Annuity</i>	220
<i>Future Value of an Annuity</i>	222
<i>Solving for the Annuity Payment</i>	224
<i>Solving for the Number of Periods in an Annuity</i>	225
<i>Solving for the Interest Rate in an Annuity</i>	226
<i>Deferred Annuities</i>	228

Graduated Annuities	230
<i>Present Value of a Graduated Annuity</i>	230
<i>Future Value of a Graduated Annuity</i>	233
<i>Solving for the Graduated Annuity Payment</i>	234
Uneven Cash Flow Streams	234
<i>Solving for the Yield in an Uneven Cash Flow Stream</i>	236
Nonannual Compounding Periods	237
<i>Continuous Compounding</i>	241
Summary	242
Problems	243

CHAPTER 9 *Common Stock Valuation* **247**

What Is Value?	248
Fundamentals of Valuation	249
Determining the Required Rate of Return	250
<i>A Simple Risk Premium Model</i>	251
<i>CAPM: A More Scientific Model</i>	251
Valuing Common Stocks	254
<i>The Constant-Growth Dividend Discount Model</i>	255
<i>The Two-Stage Growth Model</i>	260
<i>Three-Stage Growth Models</i>	262
Alternative Discounted Cash Flow Models	266
<i>The Earnings Model</i>	266
<i>The Free Cash Flow Model</i>	270
Relative Value Models	273
Preferred Stock Valuation	275
Summary	277
Problems	278
Internet Exercise	280

CHAPTER 10 *Bond Valuation* **283**

Bond Valuation	284
<i>Valuing Bonds between Coupon Dates</i>	286
<i>Using Excel's Advanced Bond Functions</i>	288
Bond Return Measures	291
<i>Current Yield</i>	291
<i>Yield to Maturity</i>	292

<i>Yield to Call</i>	294
<i>Returns on Discounted Debt Securities</i>	296
The U.S. Treasury Yield Curve	298
Bond Price Sensitivities	300
<i>Changes in the Required Return</i>	300
<i>Changes in Term to Maturity</i>	302
<i>Comparing Two Bonds with Different Maturities</i>	305
<i>Comparing Two Bonds with Different Coupon Rates</i>	307
Duration and Convexity	308
<i>Duration</i>	308
<i>Modified Duration</i>	310
<i>Visualizing the Predicted Price Change</i>	311
<i>Convexity</i>	313
Summary	315
Problems	318
Internet Exercise	320
CHAPTER 11	<i>The Cost of Capital</i> 321
The Appropriate Hurdle Rate	322
<i>The Weighted Average Cost of Capital</i>	323
<i>Determining the Weights</i>	324
WACC Calculations in Excel	325
Calculating the Component Costs	326
<i>The Cost of Common Equity</i>	327
<i>The Cost of Preferred Equity</i>	328
<i>The Cost of Debt</i>	329
Using Excel to Calculate the Component Costs	330
<i>The After-Tax Cost of Debt</i>	330
<i>The Cost of Preferred Stock</i>	332
<i>The Cost of Common Stock</i>	332
The Role of Flotation Costs	333
<i>Adding Flotation Costs to Our Worksheet</i>	334
<i>The Cost of Retained Earnings</i>	335
The Marginal WACC Curve	336
<i>Finding the Break-Points</i>	336
<i>Creating the Marginal WACC Chart</i>	340
Summary	342
Problems	342
Internet Exercise	344

CHAPTER 12 *Capital Budgeting* 347

- Estimating the Cash Flows 348
 - The Initial Outlay* 349
 - The Annual After-Tax Operating Cash Flows* 350
 - The Terminal Cash Flow* 351
 - Estimating the Cash Flows: An Example* 352
- Calculating the Relevant Cash Flows 357
- Making the Decision 358
 - The Payback Method* 359
 - The Discounted Payback Period* 361
 - Net Present Value* 363
 - The Profitability Index* 365
 - The Internal Rate of Return* 366
 - Problems with the IRR* 367
 - The Modified Internal Rate of Return* 369
- Sensitivity and Scenario Analysis 372
 - NPV Profile Charts* 372
 - Scenario Analysis* 373
- The Optimal Capital Budget 376
 - Optimal Capital Budget without Capital Rationing* 376
 - Optimal Capital Budget under Capital Rationing* 378
 - Other Techniques* 383
- Summary 383
- Problems 384

CHAPTER 13 *Risk and Capital Budgeting* 389

- Review of Some Useful Statistical Concepts 390
 - The Expected Value* 390
 - Measures of Dispersion* 392
- Using Excel to Measure Risk 395
 - The Freshly Frozen Fish Company Example* 395
- Introducing Uncertainty 399
 - Sensitivity Analysis* 399
 - Scenario Analysis* 404
 - Calculating the Expected NPV from the Scenarios* 406
 - Calculating the Variance and Standard Deviation* 407
 - Calculating the Probability of a Negative NPV* 409
 - Monte Carlo Simulation* 410
 - The Risk-Adjusted Discount Rate Method* 417
 - The Certainty-Equivalent Approach* 418

Summary 420

Problems 422

CHAPTER 14 *Portfolio Statistics and Diversification* 425

Portfolio Diversification Effects 426

Determining Portfolio Risk and Return 428

Portfolio Standard Deviation 429

Changing the Weights 432

Portfolios with More than Two Securities 434

Creating a Variance/Covariance Matrix 434

Calculating the Portfolio Standard Deviation 438

The Efficient Frontier 439

Locating Portfolios on the Efficient Frontier in Excel 440

Charting the Efficient Frontier 443

The Capital Market Line 445

Charting the Capital Market Line 448

Identifying the Market Portfolio 449

Utility Functions and the Optimal Portfolio 452

Charting Indifference Curves 452

The Capital Asset Pricing Model 454

The Security Market Line 455

Summary 457

Problems 458

Internet Exercise 461

CHAPTER 15 *Writing User-Defined Functions with VBA* 463

What Is a Macro? 464

Two Types of Macros 464

The Visual Basic Editor 466

The Project Explorer 467

The Code Window 468

The Parts of a Function 468

Writing Your First User-Defined Function 469

Writing More Complicated Functions 473

Variables and Data Types 473

The If-Then-Else Statement 475

Looping Statements 478

Using Worksheet Functions in VBA 481

Using Optional Arguments 482

	<i>Using ParamArray for Unlimited Arguments</i>	483
	Debugging VBA Code	484
	<i>Breakpoints and Code Stepping</i>	484
	<i>The Watch Window</i>	485
	<i>The Immediate Window</i>	486
	Creating Excel Add-Ins	487
	Best Practices for VBA	488
	Summary	489
	Problems	490
CHAPTER 16	<i>Analyzing Datasets with Tables and Pivot Tables</i>	493
	Creating and Using an Excel Table	494
	<i>Removing Duplicate Records from the Table</i>	496
	<i>Filtering the Table</i>	497
	<i>Sorting and Filtering Numeric Fields</i>	498
	<i>Structured Referencing for Formulas in Tables</i>	500
	Using Get & Transform	501
	<i>Cleaning the Dataset</i>	503
	<i>An Example Data Query</i>	503
	Using Pivot Tables	505
	<i>Creating a Pivot Table</i>	505
	<i>Formatting the Pivot Table</i>	507
	<i>Rearranging the Pivot Table and Adding Fields</i>	510
	<i>Transforming the Data Field Presentation</i>	511
	<i>Calculations in Pivot Tables</i>	512
	Pivot Tables for Financial Statements	513
	<i>Grouping Data by Date</i>	515
	<i>Using Pivot Charts to Show Trends Over Time</i>	517
	<i>Displaying Multiple Subtotals</i>	518
	<i>Using Calculated Fields for Financial Ratios</i>	519
	<i>Filtering Data with Slicers and Timelines</i>	521
	Extracting Data from a Pivot Table	522
	Summary	523
	Problems	524
	Internet Exercise	527
APPENDIX	<i>Directory of User-Defined Functions in FameFncs.xlam</i>	529
INDEX		533

Preface

Electronic spreadsheets have been available for microcomputers since the introduction of VisiCalc® for the Apple I in June 1979. The first version of Lotus 1-2-3® in January 1983 convinced businesses that the IBM PC was a truly useful productivity-enhancing tool. Today, any student who leaves business school without at least basic spreadsheet skills is truly at a disadvantage. Much as earlier generations had to be adept at using a slide rule or financial calculator, today's manager needs to be proficient in the use of a spreadsheet. International competition means that companies must be as efficient as possible. No longer can managers count on having a large staff of "number crunchers" at their disposal.

Microsoft first introduced Excel in 1985 for the Apple Macintosh and showed the world that spreadsheets could be both powerful and easy to use, not to mention fun. Excel 2.0 was introduced to the PC world in 1987 for Microsoft Windows version 1.0, where it enjoyed something of a cult following. With the introduction of version 3.0 of Windows, sales of Excel exploded so that today it is the leading spreadsheet on the market.

As of this writing, Excel 2016 (also known as Excel version 16) is the current version. Unlike Excel 2007, which introduced the Ribbon interface, Excel 2016 is more evolutionary than revolutionary. The changes are mostly cosmetic, though the addition of Get & Transform is a truly valuable new feature (see Chapter 16). While the book has been written with the current version in mind, it can be used with older versions, if allowances are made for minor interface differences.

The user interface has always been different on the Apple Mac, but Excel 2016 for Mac supports virtually all of the features discussed in this book (the Analysis ToolPak add-in was finally added in this version). The major missing features are pivot charts and the Get &

Transform tools. Both of those features are used in Chapter 16, but Get & Transform is also used in Chapter 10 to get yield curve data from the U.S. Treasury Web site. Mac users can access the yield curve data by using the From Web tool in Get External Data instead. I have made a document, *Fame 8e Guide for Mac Users.pdf*, that is available on the *Financial Analysis with Microsoft Excel*, 8th ed. Instructor Companion Web site.

Purpose of the Book

Financial Analysis with Microsoft Excel, 8th ed. was written to demonstrate useful spreadsheet techniques and tools in a financial context. This allows readers to see the material in a way with which they are familiar. For students just beginning their education in finance, the book provides a thorough explanation of all of the concepts and equations that are usually covered. In other words, it is a corporate finance textbook, but it uses Excel instead of financial calculators.

Students with no prior experience with spreadsheets will find that using Excel is very intuitive, especially if they have used other Windows applications. For these students, *Financial Analysis with Microsoft Excel*, 8th ed. will provide a thorough introduction to the use of spreadsheets from basic screen navigation skills to building fairly complex financial models. I have found that even students with good spreadsheet skills have learned a great deal more about using Excel than they expected.

Finally, I feel strongly that providing pre-built spreadsheet templates for students to use is a disservice. For this reason, this book concentrates on spreadsheet building skills. I believe that students can gain valuable insights and a deeper understanding of financial analysis by actually building their own spreadsheets. By creating their own spreadsheets, students will have to confront many issues that might otherwise be swept under the carpet. It continually amazes me how thankful students are when they are actually forced to think rather than just to “plug and go.” For this reason the book concentrates on spreadsheet building skills (though all of the templates are included for instructors) so that students will be encouraged to think and truly understand the problems on which they are working.

Target Audience

Financial Analysis with Microsoft Excel is aimed at a wide variety of students and practitioners of finance. The topics covered generally follow those in an introductory financial management course for undergraduates or first-year MBA students. Because of the emphasis on spreadsheet building skills, the book is also appropriate as a reference for case-oriented courses in which the spreadsheet is used extensively. I have been using the book in

my Financial Modeling course since 1995, and students consistently say that it is the most useful course they have taken. A sizable number of my former students have landed jobs due to their superior spreadsheet skills.

I have tried to make the book complete enough that it may also be used for self-paced learning, and, if my e-mail is any guide, many have successfully taken this route. I assume, however, that the reader has some familiarity with the basic concepts of accounting and statistics. Instructors will find that their students can use this book on their own time to learn Excel, thereby minimizing the amount of class time required for teaching the rudiments of spreadsheets. Practitioners will find that the book will help them transfer skills from other spreadsheets to Excel and, at the same time, refresh their knowledge of corporate finance.

A Note to Students

As I have noted, this book is designed to help you learn finance and understand spreadsheets at the same time. Learning finance alone can be a daunting task, but I hope that learning to use Excel at the same time will make your job easier and more fun. Be sure to experiment with the examples by changing numbers and creating charts.

You will likely find that learning the material and skills presented is more difficult if you do not work the examples presented in each chapter. While this will be somewhat time consuming, I encourage you to work along with, rather than just read, the book as each example is discussed. Further, I suggest that you try to avoid the trap of memorizing Excel formulas. Instead, try to understand the logic of the formula so that you can more easily apply it in other, slightly different, situations in the future.

Make sure that you save your work often, and keep a current backup.

Organization of the Book

Financial Analysis with Microsoft Excel, 8th ed. is organized along the lines of an introductory financial management textbook. The book can stand alone or be used as an adjunct to a regular text, but it is not “just a spreadsheet book” and shouldn’t be treated as a cookbook with recipes. In most cases, topics are covered at the same depth as the material in conventional textbooks; in many cases, the topics are covered in greater depth. For this reason, I believe that *Financial Analysis with Microsoft Excel*, 8th ed. can be used as a comprehensive primary text. The book is organized as follows:

- Chapter 1: Introduction to Excel 2016
- Chapter 2: The Basic Financial Statements

- Chapter 3: Financial Statement Analysis Tools
- Chapter 4: The Cash Budget
- Chapter 5: Financial Statement Forecasting
- Chapter 6: Forecasting Sales with Time Series Methods
- Chapter 7: Break-Even and Leverage Analysis
- Chapter 8: The Time Value of Money
- Chapter 9: Common Stock Valuation
- Chapter 10: Bond Valuation
- Chapter 11: The Cost of Capital
- Chapter 12: Capital Budgeting
- Chapter 13: Risk and Capital Budgeting
- Chapter 14: Portfolio Statistics and Diversification
- Chapter 15: Writing User-Defined Functions with VBA
- Chapter 16: Analyzing Datasets with Tables and Pivot Tables
- Appendix: Directory of User-Defined Functions in FameFncs.xlam

Extensive use of built-in functions, charts, and other tools (e.g., Scenario Manager and Solver) throughout the book encourages a much deeper exploration of the models presented than do more traditional methods. Questions such as, “What would happen if...” are easily answered with the tools and techniques taught in this book.

Outstanding Features

The most outstanding feature of *Financial Analysis with Microsoft Excel*, 8th ed. is its use of Excel as a learning tool rather than just a fancy calculator. Students using the book will be able to demonstrate to themselves how and why things are the way they are. Once students create a worksheet, they understand how it works and the assumptions behind the calculations. Thus, unlike the traditional “template” approach, students gain a deeper understanding of the material. In addition, the book greatly facilitates the professors’ use of spreadsheets in their courses.

The text takes a self-teaching approach used by many other “how-to” spreadsheet books, but it provides opportunities for much more in-depth experimentation than the competition. For

example, scenario analysis is an often recommended technique, but it is rarely demonstrated in any depth. This book uses the tools that are built into Excel to greatly simplify computation-intensive techniques, eliminating the boredom of tedious calculation. Other examples include regression analysis, linear and nonlinear programming, and Monte Carlo simulation. The book encourages students to actually use the tools that they have learned about in their statistics and management science classes.

Pedagogical Features

Financial Analysis with Microsoft Excel, 8th ed. begins by teaching the basics of Excel. Then, the text uses Excel to build the basic financial statements that students encounter in all levels of financial management courses. This coverage then acts as a “springboard” into more advanced material such as performance evaluation, forecasting, valuation, capital budgeting, and modern portfolio theory. Each chapter builds upon the techniques learned in prior chapters so that the student becomes familiar with Excel and finance at the same time. This type of approach facilitates the professor’s incorporation of Excel into a financial management course since it reduces, or eliminates, the necessity of teaching spreadsheet usage in class. It also helps students to see how this vital “tool” is used to solve the financial problems faced by practitioners.

The chapters are organized so that a problem is introduced, solved by traditional methods, and then solved using Excel. I believe that this approach relieves much of the quantitative complexity while enhancing student understanding through repetition and experimentation. This approach also generates interest in the subject matter that a traditional lecture cannot (especially for nonfinance business majors who are required to take a course in financial management). Once they are familiar with Excel, my students typically enjoy using it and spend more time with the subject than they otherwise would. In addition, since charts are used extensively (and are created by the student), the material may be better retained.

A list of learning objectives precedes each chapter, and a summary of the major Excel functions discussed in the chapter is included at the end. In addition, each chapter contains homework problems, and many include Internet Exercises that introduce students to sources of information on the Internet.

Supplements

The Instructor’s Manual and other resources, available online, contain the following:

(These materials are available to registered instructors at the Instructor Companion Web site for *Financial Analysis with Microsoft Excel*, 8th ed., www.cengagebrain.com).

- The completed worksheets with solutions to all problems covered in the text. Having this material on the Instructor Companion Web site (www.cengagebrain.com) allows the instructor to easily create transparencies or give live demonstrations via computer projections in class without having to build the spreadsheets from scratch.

- Additional Excel spreadsheet problems for each chapter that relate directly to the concepts covered in that chapter. Each problem requires the student to build a worksheet to solve a common financial management problem. Often the problems require solutions in a graphical format.
- Complete solutions to the in-text homework problems and those in the Instructor’s Manual and on the Instructor Companion Web site, along with clarifying notes on techniques used.
- An Excel add-in program that contains some functions that simplify complex calculations such as the two-stage common stock valuation model and the payback period, among many others (see the Appendix for a complete listing of the functions). Also included is an add-in program for performing Monte-Carlo simulations discussed extensively in Chapter 13, and an add-in to create “live” variance/covariance matrices. These add-ins are available on the Web site.

Typography Conventions

The main text of this book is set in the 10-point Times New Roman True Type font. Text or numbers that readers are expected to enter are set in the 10 point Courier New True Type font.

The names of built-in functions are set in small caps and boldface. Function arguments can be either required or optional. Required inputs are set in small caps and are italicized and boldface. Optional inputs are set in small caps and italicized. As an example, consider the **PV** function (introduced in Chapter 8):

PV(*RATE*, *NPER*, *PMT*, *FV*, *TYPE*)

In this example, **PV** is the name of the function, *RATE*, *NPER*, and *PMT*, are the required arguments, while *FV* and *TYPE* are optional.

In equations and the text, equation variables (which are distinct from function arguments) are italicized. As an example, consider the *PV* equation:

$$PV = \frac{FV_N}{(1+i)^N}$$

I hope that these conventions will help avoid confusion due to similar terms being used in different contexts.

Changes from the 7th Edition

The overall organization of the book remains similar, but there have been many changes throughout the book. All of the chapters have been updated, but the more important changes include:

Chapter 1—Updated for Excel 2016, including coverage of the new charting interface that uses buttons for chart elements and panels for formatting.

Chapter 6—This is a completely new chapter covering the use of time series forecasting techniques for forecasting revenue. It includes a method of decomposing a time series into its component parts, as well as forecasting techniques that deal with trends and seasonality.

Chapter 8—Added to the coverage of graduated annuities with a discussion of how to calculate the payment amount. In addition, the existing user-defined functions were reworked so as to be more consistent with the built-in time value functions.

Chapter 10—Added a method of calculating the convexity of a bond on any date using the built-in **PRICE** function. This method is simple but is still a close approximation. I have also updated the **FAME_CONVEXITY** function to calculate exact convexity on any date. Additionally, I have used the Get & Transform (see below) tools to query the U.S. Treasury Web site for data used to create the yield curve.

Chapter 16—Added coverage of the new Get & Transform tool that is available on the Data tab. This is a very powerful tool that is used to query database files, Excel worksheets, and Web sites. It is essentially a built-in ETL (Extract, Transform, and Load) tool that makes processing internal or external data much easier than before.

In addition, I swapped the positions of Chapters 3 and 4 so that coverage of financial ratios now follows coverage of financial statements.

A Note on the Internet

I have tried to incorporate Internet Exercises into those chapters where the use of the Internet is applicable. In many cases, the necessary data simply is not available to the public or very difficult to obtain online (e.g., cash budgeting), so some chapters do not have Internet Exercises. For those chapters that do, I have tried to describe the steps necessary to obtain the data—primarily from either the SEC’s Edgar System or Yahoo! Finance. It should be noted that Web sites change frequently and these instructions and URLs may change in the future. I chose the Edgar System and Yahoo! Finance because I believe that these sites are the least likely to undergo severe changes and/or disappear completely. In many cases, there are alternative sites from which the data can be obtained if it is no longer available from the given site. All Excel spreadsheets for students’ and instructors’ use (as referenced in the book) are available at the Student and Instructor Companion Web sites (www.cengagebrain.com).

Acknowledgments

All books are collaborative projects, with input from more than just the listed authors. This is true in this case as well. I wish to thank those colleagues and students who have reviewed and tested the book to this point. Any remaining errors are my sole responsibility, and they may be reported to me by e-mail.

For this edition, I would like to thank two of my colleagues at Metro State: Qiongqi Xiao and Su-Jane Chen were very kind to review chapters or sections of chapters. Douglas Jordan of Sonoma State University also provided valuable input, particularly the suggestion of swapping Chapters 3 and 4. The input of the anonymous reviewers who responded to surveys is also greatly appreciated. I would also like to thank Debra Dalglish, an author of several books on pivot tables, Microsoft Excel MVP, and a blogger at blog.contextures.com, for answering some technical questions about pivot tables.

I would also like to thank the several reviewers who spent a great deal of time and effort reading over the previous editions. These reviewers are Tom Arnold of the University of Richmond, Denise Bloom of Viterbo University, David Suk of Rider College, Mark Holder of Kent State University, Scott Ballantyne of Alvernia College, John Stephens of Tri State University, Jong Yi of California State University Los Angeles, and Saiyid Islam of Virginia Tech. I sincerely appreciate their efforts. In particular, I would like to thank Nancy Jay of Mercer University—Atlanta for her scrupulous editing of the chapters and homework problems in the first three editions.

Many people long ago provided invaluable help on the first and second editions of this text, and their assistance is still appreciated. Professional colleagues include Ezra Byler, Anthony Crawford, Charles Haley, David Hua, Stuart Michelson, Mohammad Robbani, Gary McClure, and John Settle. In addition, several of my now former students at Metropolitan State University of Denver were helpful—most especially, Peter Ormsbee, Marjo Turkki, Kevin Hatch, Ron LeClere, Christine Schouten, Edson Holland, Mitch Cohen, and Theresa Lewingdon.

Finally, I wish to express my gratitude to Joe Sabatino (Senior Product Team Manager), Julie Dierig (Project Manager), and Tara Slagle (Senior Content Project Manager) of the Cengage Learning team. Without their help, confidence, and support, this book would never have been written. To anybody I have forgotten, I heartily apologize.

I encourage you to send your comments and suggestions, however minor they may seem to you, to mayest@msudenver.edu.

Timothy R. Mayes
December 2016

After studying this chapter, you should be able to:

1. *Explain the basic purpose of a spreadsheet program.*
2. *Identify the various components of the Excel screen.*
3. *Navigate the Excel worksheet (entering, correcting, and moving data within the worksheet).*
4. *Explain the purpose and usage of Excel's built-in functions and user-defined functions.*
5. *Create graphics and know how to print and save files in Excel.*

The term “spreadsheet” covers a wide variety of elements useful for quantitative analysis of all kinds. Essentially, a spreadsheet is a simple tool consisting of a matrix of cells that can store numbers, text, or formulas. The spreadsheet’s power comes from its ability to recalculate results as you change the contents of other cells. No longer does the user need to do these calculations by hand or on a calculator. Instead, with a properly constructed spreadsheet, changing a single number (say, a sales forecast) can result in literally thousands of automatic changes in the model. The freedom and productivity enhancement provided by modern spreadsheets present an unparalleled opportunity for learning financial analysis.

Spreadsheet Uses

Spreadsheets today contain built-in analytical capabilities previously unavailable in a single package. Years ago, users often had to learn a variety of specialized software packages to do any relatively complex analysis. With the newest versions of Microsoft Excel, users can perform tasks ranging from the routine maintenance of financial statements to multivariate regression analysis to Monte Carlo simulations of hedging strategies.

It is impossible to enumerate all of the possible applications for spreadsheets. You should keep in mind that spreadsheets are useful not only for financial analysis but also for any type of quantitative analysis whether your specialty is in marketing, management, engineering, statistics, or economics. For that matter, a spreadsheet can also prove valuable for personal uses. With Excel, it is a fairly simple matter to build a spreadsheet to monitor your investment portfolio, plan for retirement, experiment with various mortgage options when buying a house, create and maintain a mailing list, and so on. The possibilities are quite literally endless. The more comfortable you become with the spreadsheet, the more uses you will find. Using a spreadsheet can help you find solutions that you never would have imagined on your own. Above all, feel free to experiment and try new things as you gain more experience working with spreadsheet programs, particularly Excel.

The above is not meant to suggest that Excel is the only analytical tool you'll ever need. For example, Excel is not meant to be a relational database, though it has some tools that allow it to work well for small databases (see Chapter 16). For bigger projects, however, Excel can serve as a very effective "front-end" interface to a database. It also isn't a complete replacement for a dedicated statistics program, though it can work well for many statistical problems. Although Excel can be made to do just about anything, it isn't always the best tool for the job. Still, it may well be the best tool that you or your colleagues know how to use.

Starting Microsoft Excel



Excel 2016 Icon

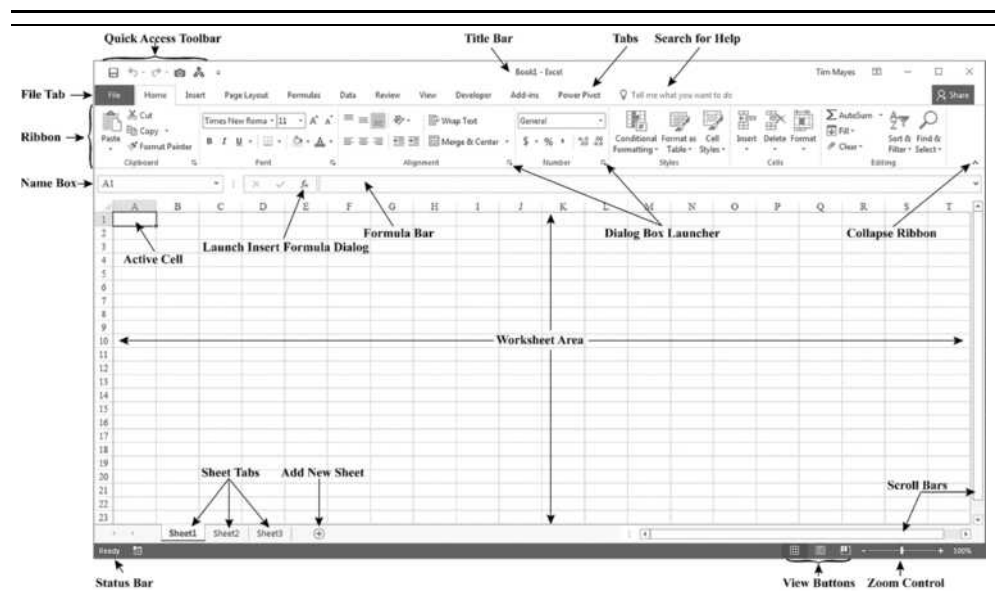
Start Excel by double-clicking on the program's icon. The location of the Excel icon will depend on the organization of your system. You may have the Excel icon (at left) on the desktop or in the taskbar. Otherwise, you can start Excel by clicking the Start button and then clicking the Excel 2016 tile, or type `Excel` into the search box at the bottom of the Start menu. If you have Windows 10 and a microphone, then you can even tell Cortana to "start Excel 2016."

For easier access, you may wish to create a Desktop or Taskbar shortcut. To do this, click on the Excel icon in the All Apps menu and drag the icon to the Desktop or Taskbar. Remember that a shortcut is not the program itself, so you can safely delete the shortcut if you later decide that you no longer need it.

Parts of the Excel Screen

If you have used any recent version of Excel, then you will be familiar with most of the user interface in Excel 2016. In Figure 1-1, note the labeled parts of the Excel screen. We will examine most of these parts separately. Please refer to Figure 1-1 as you read through each of the sections that follow.

FIGURE 1-1
MICROSOFT EXCEL 2016



The File Tab and Quick Access Toolbar

The File tab in Excel 2016 is similar to the File menu in most other Windows programs. It can be opened either by clicking the tab or by pressing Alt-F. Click the File tab when you need to open, save, print, or create a new file.

The File tab also contains additional functionality. It opens in what is known as *Backstage View*, which takes over the entire window. This additional space, compared to a menu, allows for much more information to be displayed. For example, if you click the Print tab on the left side, you get access not only to all of the print settings but also to print preview on the same page. The Info tab is where you can set the document properties (author, keywords, etc.), inspect the document for hidden data that may reveal private details, encrypt the spreadsheet, and so on.

Finally, the File tab is the pathway to setting the program options. At the bottom of the tabs on the left you will find a link to Options. This launches the Excel Options dialog box where you can set all of the available options. It is advisable to go through the Excel Options to familiarize yourself with some of the things that you can control. While you may not understand all of the choices, at least you will know where to go when you need to change something (e.g., the user name, macro security level, or the default file locations).

You also have the ability to customize the Ribbon. Click the File tab, choose Options, and then select Customize Ribbon in the dialog box. Here you can create new tabs, move buttons from one tab to another, remove them completely, and even export your customizations so that others can use them.

The Quick Access toolbar (typically abbreviated as QAT) is located above the File tab and, by default, provides a button to save the current file as well as the Undo and Redo buttons. If you regularly use commands that aren't located on the Home tab, you can easily customize the Quick Access toolbar to add those commands by right-clicking the QAT and choosing "Customize Quick Access Toolbar..." The dialog box is self-explanatory. You can also add or remove commands, such as Print Preview, by clicking the arrow to the right of the QAT.

The Home Tab

FIGURE 1-2
EXCEL 2016 HOME TAB



Immediately below the title bar, Excel displays the various tabs in what is known as the *Ribbon*. Tabs are the toolbars that replaced the menus of pre-2007 versions. The Home tab contains the most commonly used commands, including the Cut, Copy, and Paste buttons, and the various cell formatting buttons. You can learn what function each button performs by letting the mouse pointer hover over a button. After a few seconds, a message will appear that informs you of the button's function. This message is known as a *ToolTip*. ToolTips are used frequently by Excel to help you identify the function of various items on the screen.

Note that several of the buttons (e.g., the Copy and Paste buttons) on the Ribbon have a downward-pointing arrow. This is a signal that the button has options besides the default behavior. For example, by clicking the arrow on the Paste button you will find that there are several choices regarding what to paste (e.g., just the formula, or the value without the formula). Clicking the upper half of a split button invokes the default purpose.



The other tabs are named according to their functionality, and you will quickly learn which one to choose in order to carry out a command. Table 1-1 shows the other tabs and a short description of what they do.

TABLE 1-1
OTHER TABS IN THE EXCEL 2016 RIBBON

Tab	What It Does
File	File management features (open, save, close, print, etc.) and options.
Insert	Contains buttons for inserting pivot tables, charts, pictures, shapes, text boxes, equations, and other objects.
Page Layout	Has choices that control the look of the worksheet on the screen and when printed. You can change the document theme, the page margins and orientation, and so on.
Formulas	This is where to go when you want to insert a formula, create a defined name for a cell or range, or use the formula auditing tools to find errors.
Data	Contains buttons to guide you through getting data from other sources (such as an Access database, a Web site, or a text file). Launch tools such as the Scenario Manager, Goal Seek, Solver, and the Analysis Toolpak.
Review	Here you will find spell check, the thesaurus, and also commands for working with cell comments and worksheet protection.
View	Contains commands that control the worksheet views, zoom controls, and the visibility of various objects on the screen (such as gridlines and the formula bar).
Developer	Has tools that allow you to access the VBA editor, insert controls (e.g., dropdown lists), and work with XML. This tab is not visible by default, but can be enabled in Options.
Add-ins	This is where older Excel add-ins that create custom tool bars and menus will be located. Not visible unless older add-ins are installed.
Power Pivot	Power Pivot is an add-in for certain versions of Excel. It allows you to work with data files that are much larger than Excel can normally handle.

Note that another set of tabs will appear when you are working on charts. The Design and Format tabs contain all of the options that you will need for working with charts (see “Creating Graphics” on page 26). Furthermore, add-in programs may create additional tabs.

The Formula Bar

As you work more in Excel to create financial models, you will find that the formula bar is one of its most useful features. The formula bar displays information about the currently selected cell, which is referred to as the active cell. The left part of the formula bar indicates the name or address of the selected cell (H9 in Figure 1-3). The right part of the formula bar displays the contents of the selected cell. If the cell contains a formula, the formula bar displays the formula while the cell itself displays the result of the formula. If text or numbers have been entered, then the text or numbers are displayed.

FIGURE 1-3
THE EXCEL 2016 FORMULA BAR



The f_x button on the formula bar is used to show the Insert Function dialog box. This dialog box helps you to find and enter functions without having to memorize them. It works the same as the Insert Function button on the Formulas tab. See page 21 for more information.

The chevron at the right of the formula bar is used to expand the formula bar. This is useful if you have long formulas that occupy more than one line. You can break long formulas across multiple lines by pressing Alt+Enter where you want the line to break. If you do this, then you can expand the formula bar even further by dragging its lower edge.

The Worksheet Area

The worksheet area is where the real work of the spreadsheet is done. The worksheet is a matrix of cells (1,048,576 rows by 16,384 columns),¹ each of which can contain text, numbers, or formulas. Each cell is referred to by a column letter and a row number. Column letters (A, B, C, ..., XFD) are listed at the top of each column, and row numbers (1, 2, 3, ..., 1048576) are listed to the left of each row. The cell in the upper left corner of the worksheet is therefore referred to as cell A1, the cell immediately below A1 is referred to as cell A2, the cell to the right of A1 is cell B1, and so on. This naming convention is common to all spreadsheet programs. If not already, you will become comfortable with it once you have gained some experience working in Excel.

The active cell can be identified by a solid black border around the cell. Note that the active cell is not always visible on the screen, but its address is always named in the leftmost portion of the formula bar. In the lower-right corner is the AutoFill handle (see page 11).

1. This is known as the “big grid” because it is much larger than in pre-2007 versions of Excel, which only supported up to 65,536 rows and 256 columns.

Sheet Tabs

FIGURE 1-4
THE SHEET TABS



Excel worksheets are stored in a format that allows you to combine multiple worksheets into one file known as a *workbook*. This allows several related worksheets to be contained in one file for easy access. The sheet tabs, near the bottom of the screen, enable you to move easily from one sheet to another in a workbook. You may rename, copy, or delete any existing sheet or insert a new sheet by right-clicking a sheet tab with the mouse and making a choice from the resulting menu. You can change the order of the sheet tabs by clicking a tab and dragging it to a new position, or you can press the Ctrl key (option on Mac) and drag to copy it. To insert a new worksheet, click the New Sheet button to the right of the last worksheet.

It is easy to do any of these operations on multiple worksheets at once, except for renaming. Simply click the first sheet and then Ctrl+click each of the others. (You can select a contiguous group of sheets by selecting the first and then Shift+click the last.) Now, right-click one of the selected sheets and select the appropriate option from the pop-up menu. When sheets are grouped, anything you do to one sheet gets done to all. This feature is useful if, for example, you need to enter identical data into multiple sheets or need to perform identical formatting on several sheets. To ungroup the sheets, either click on any nongrouped sheet or right-click a sheet tab and choose **U**ngroup Sheets from the pop-up menu. Another feature in Excel 2016 allows you to choose a color for each sheet tab by right-clicking the tab and choosing a **T**ab Color from the pop-up menu.

The transport buttons to the left of the sheet tabs allow you to scroll through the list of sheet tabs. Right-clicking either of these buttons will display a pop-up menu that allows you to quickly jump to any sheet tab in the workbook. This is especially helpful when you have too many tabs for them all to be shown.

Status Bar

The status bar, located below the sheet tabs, contains information regarding the current state of Excel, as well as certain messages. For example, most of the time the only message is “Ready” indicating that Excel is waiting for input. At other times, Excel may add “Calculate” to the status bar to indicate that it needs to recalculate the worksheet because of changes. You can also direct Excel to do certain calculations on the status bar. For example, in Figure 1-5, Excel is showing the average, count, and sum of the highlighted cells in the worksheet.

FIGURE 1-5
THE STATUS BAR



By right-clicking on this area of the status bar, you can also get Excel to calculate the count of numbers only, the minimum, or the maximum of any highlighted cells. This is useful when you need a quick calculation that doesn't need to be in the worksheet.

The right side of the status bar contains buttons to change the view of the worksheet (normal, page layout, and page break preview) as well as the zoom level.

Navigating the Worksheet

There are two principal ways for moving around within the worksheet area: the arrow keys and the mouse (or touchpad). For small distances the arrow keys provide an easy method of changing the active cell, but moving to more distant cells is usually easier with the mouse.

Most keyboards have a separate keypad containing arrows pointing up, down, left, and right. If yours does not, then the numeric keypad can be used if the Num Lock function is off. You can use the Tab key to move one cell to the right. The Page Up and Page Down keys also work as you would expect.

The mouse is even easier to use. When the mouse pointer is over the worksheet area, it will be in the shape of a fat cross. To change the active cell, move the mouse pointer over the destination cell and click. To move to a cell that is not currently displayed on the screen, click on the scroll bars until the cell is visible and then click on it. For example, if the active cell is A1 and you wish to make A100 the active cell, click on the scroll bar on the right hand part of the screen until A100 is visible. Move the mouse pointer over cell A100 and click with the left button. Each click on the scroll bar moves the worksheet up or down one page. If you wish to move up, click above the thumb. If down, click beneath the thumb. The thumb (or slider) is the button that moves up and down the scroll bar to indicate your position in the worksheet. To move more quickly, you can drag the thumb to the desired position.

If you know the name or address of the cell to which you wish to move (for large worksheets remembering the cell address isn't easy, but you can use named ranges), use the Go To command. The Go To command will change the active cell to whatever cell you indicate. The Go To dialog box can be used by clicking the Find & Select button on the Home tab and then choosing the **Go To...** command, by pressing the F5 function key, or by pressing the Ctrl+G key combination. To move to cell A50, simply press F5, type: A50 in the Reference box, and then press Enter. You will notice that cell A50 is now highlighted and visible on the



screen. You can also use Go To to find certain special cells (e.g., the last cell that has data in it) by pressing the Special... button in the Go To dialog box.

Selecting a Range of Cells

Many times you will need to select more than one cell at a time. For example, you may wish to apply a particular number format to a whole range of cells, or you might want to clear a whole range. Because it would be cumbersome to do this one cell at a time, especially for a large range, Excel allows you to simultaneously select a whole range and perform various functions on all of the cells at once. The easiest way to select a contiguous range of cells is to use the mouse. Simply point to the cell in the upper left corner of the range, and click and drag the mouse until the entire range is highlighted. As you drag the mouse, watch the left side of the formula bar. Excel will inform you of the number of selected rows and columns. In addition, the row and column headers will be highlighted for the selected cells.

You can also use the keyboard to select a range. First change the active cell to the upper left corner of the range to be selected, press and hold down the Shift key, and use the arrow keys to highlight the entire range. Note that if you release the Shift key while pressing an arrow key, you will lose the selection. A very useful keyboard shortcut is the Shift+Ctrl+Arrow (any arrow key will work) combination. This is used to select all of the cells from the active cell up to, but not including, the first blank cell. For example, if you have 100 numbers in a column and need to apply a format, just select the first cell and then press Shift+Ctrl+Down arrow to select them all. This is faster and more accurate than using the mouse.

Often it is also useful to select a discontinuous range (i.e., two or more unconnected ranges) of cells. To do this, simply select the first range as usual and then hold down the Ctrl key as you select the other ranges.

Using Defined Names

A named range is a cell, or group of cells, for which you have supplied a name. Named ranges can be useful in a number of different ways, but locating a range on a big worksheet is probably the most common use. To name a range of cells, start by selecting the range. For example, select A1:C5 and then choose Define Name from the Formulas tab. At the top of the New Name dialog box, enter a name, say MyRange (note that a range name cannot contain spaces or most special characters). Figure 1-6 shows how the dialog box should look. Note that the Refers to edit box shows the address to which the name refers.²



2. The name is actually defined as a formula. This is important for some of the more advanced uses of named ranges. For example, we can use a name to define constants, do calculations, or to create a reference to a range that grows as data is added.