MrExcel

Bill Jelen

PowerPivot for the Data Analyst:

Microsoft® Excel® 2010

DO COMPLEX **BI** WITHOUT **IT** HELP
ANALYZE HUGE DATA SETS INSTANTLY
INTEGRATE MULTIPLE DATA SOURCES
USE DAX MEASURES & FUNCTIONS
CREATE MORE ACTIONABLE REPORTS
PUBLISH TO SHAREPOINT
TROUBLESHOOT POWERPIVOT PROBLEMS

que®

MrExcel LIBRARY

PowerPivot for the Data Analyst: Microsoft® Excel 2010

Bill Jelen

que®

800 East 96th Street,
Indianapolis, Indiana 46240
USA

Contents at a Glance

	Introduction	1
1	Downloading and Installing PowerPivot	9
2	The Promise of PowerPivot	17
3	Why Wouldn't I Build Every Future Pivot Table in PowerPivot?	37
4	Getting Your Data into PowerPivot	61
5	Creating and Managing Relationships	85
6	Using Data Sheet View	101
7	Building Pivot Tables	149
8	Cool Tricks Native to Pivot Tables	175
9	Cool Tricks New with PowerPivot	199
10	Using DAX for Aggregate Functions	217
11	Using DAX for Date Magic	241
12	Named Sets, GetPivotData, and Cube Formulas	251
13	Final Formatting: Making the Report Not Look Like Excel	267
14	Upgrading to PowerPivot Server	285
	Appendix A: More Resources	295
	Index	299

PowerPivot for the Data Analyst: Microsoft® Excel 2010

Copyright ©2010 by Pearson Education, Inc.

All rights reserved. No part of this book shall be reproduced, stored in a retrieval system, or transmitted by any means, electronic, mechanical, photocopying, recording, or otherwise, withtion of this book, the publisher and author assume no responsibility for errors or omissions. Nor is any liability assumed for damages resulting from the use of the information contained herein.

Library of Congress Cataloging-in-Publication Data

Jelen, Bill.
PowerPivot for the data analyst : Microsoft Excel 2010 / Bill Jelen.
p. cm.
Includes index.
ISBN-13: 978-0-7897-4315-2
ISBN-10: 0-7897-4315-9
1. Microsoft Excel (Computer file) 2. Business intelligence—Computer programs. 3. Business—Computer programs. I. Title.
HF5548.4.M523J4544 2010
005.54—dc22

2010017037

ISBN-13: 978-0-7897-4315-2
ISBN-10: 0-7897-4315-9

Printed in the United States of America

Second Printing: August 2011

Trademarks

All terms mentioned in this book that are known to be trademarks or service marks have been appropriately capitalized. Que Publishing cannot attest to the accuracy of this information. Use of a term in this book should not be regarded as affecting the validity of any trademark or service mark.

Warning and Disclaimer

Every effort has been made to make this book as complete and as accurate as possible, but no warranty or fitness is implied. The information provided is on an "as is" basis. The author and the publisher shall have neither liability nor responsibility to any person or entity with respect to any loss or damages arising from the information contained in this book.

Bulk Sales

Que Publishing offers excellent discounts on this book when ordered in quantity for bulk purchases or special sales. For more information, please contact

U.S. Corporate and Government Sales
1-800-382-3419
corpsales@pearsontechgroup.com

For sales outside of the United States, please contact

International Sales
1-317-428-3341
international@pearsontechgroup.com

Associate Publisher
Greg Wiegand

Aquistions Editor
Loretta Yates

Development Editor
Sondra Scott

Technical Editor
Bob Umlas

Managing Editor
Sandra Schroeder

Project Editor
Mandie Frank

Copy Editor
Keith Cline

Indexer
Tim Wright

Proofreader
Leslie Joseph

Production
Jake McFarland

Designer
Anne Jones

Contents

Introduction **1**

"There's Row 20 Million" 2

"The PivotTable Field List Has Fields from Both Tables" 2

Now, I Love VLOOKUPs 3

"How Much Will This Cost? Well, the Client Is Free" 4

This Book Was Pitched Eight Hours Later 4

There Could Be Five Titles for This Book 4

Who *Are* Those Other People in the Room? 5

This Book Is For The Excel People 6

How This Book Is Organized 7

Conventions Used in This Book 7

Text Conventions 7

Special Elements 8

Cross References 8

1 Downloading and Installing PowerPivot **9**

System Requirements 9

32 Bit or 64 Bit? 9

Not Excel Starter Edition 11

Not Excel Web Apps 11

Installing PowerPivot 11

The Many PowerPivot Tabs 11

Ribbon Tabs in the PowerPivot Application 12

Uninstalling PowerPivot 16

Next Steps 16

2 The Promise of PowerPivot **17**

Preparing Your Data for PowerPivot 17

Getting Your Data into PowerPivot 18

Decide on a Sequence for Importing 19

Import a Text File 19

Add Excel Data by Copying and Pasting 22

Define Relationships 23

Add Calculated Columns Using DAX 25

Build a Pivot Table 26

World-Class Data Compression 31

Asymmetric Reporting with PowerPivot 33

Next Steps 34

3 Why Wouldn't I Build Every Future Pivot Table in PowerPivot? 37

Great Reasons to Use PowerPivot 38
Create One Pivot Table from Multiple Tables 38
Use Massive Data Volumes 39
Fit More Data into Memory 39
Use Named Sets to Build Asymmetric Pivot Tables 39
Join Four Pivot Tables Together Using a Single Set of Slicers 40
PowerPivot Slicer AutoLayout Runs Circles Around Regular Excel Slicers 41
PowerPivot Allows for Standalone Pivot Charts 42
Convert Your PowerPivot Pivot Table to Formulas 43
Measures Created by DAX Run Circles Around Calculated Fields 43

The Downside of PowerPivot 44
You Lose Undo 44
PowerPivot Is Not Smart Enough to Sort Jan, Feb, Mar, Apr 44
It's Hard to Change the Calculation in the Pivot Table 46
You Cannot Create PowerPivot Pivot Tables with VBA 49
You Cannot Edit a Single Cell in the PowerPivot Window 49
`GetPivotData` Is Harder to Use with PowerPivot 49
Show Items with No Data Is Grayed Out 51
Calculated Fields and Calculated Items Are Grayed Out 52
You Cannot Double-Click to Drill Through 52
Grouping Does Not Work with PowerPivot 53
Certain On-Worksheet Typing Adjustments Do Not Work in PowerPivot 55
Greatest Pivot Table Trick of All Time: Show Pages Does Not Work 57
Other Minor Annoyances 58

Bottom Line 58
Next Steps 60

4 Getting Your Data into PowerPivot 61

Getting Excel Data into PowerPivot 61
Converting Your Data to a Table and Linking 62
Add Excel Data by Copying and Pasting 67
Adding Excel Data by Importing 76

Importing Data from SQL Server 79

Importing a Text File 80

Importing from Atom Data Feeds 83

Importing from Other Sources 83
Next Steps 84

5 Creating and Managing Relationships 85

Trying to Autodetect Relationships 85

Manually Defining a Relationship 88

Calculating Between Tables 89

Defining a Difficult Relationship ... 91
Unwinding a Lookup Table ... 91
Building a Concatenated Key Relationship ... 95
Is This Harder Than a VLOOKUP? ... 98
Questions About Relationships ... 98
Next Steps ... 100

6 Using Data Sheet View ... 101

Working with Data in the PowerPivot Window ... 101
Applying Numeric Formatting ... 102
Sorting Data in the PowerPivot Window ... 104
Filtering in the PowerPivot Window ... 104
Rearranging Columns ... 106
Hiding Columns at Two Levels ... 108
Using PowerPivot Undo and Redo ... 109
Deleting Columns ... 109
Using the Context Menu ... 109
Adding New Columns Using DAX Formulas ... 110
Operators in the DAX Language ... 110
Building Formulas in the PowerPivot Grid ... 111
DAX Function Reference ... 112
Date and Time Functions ... 112
Using YEARFRAC to Calculate Elapsed Time ... 119
Using TIMEVALUE to Convert Text Times to Real Times ... 123
Examples of Math and Trigonometry Functions ... 123
Examples of Text Functions ... 130
Examples of Text Functions ... 132
Examples of Logical Functions ... 139
Examples of Information Functions ... 142
Grabbing Values from a Related Table ... 142
Using One Value from a Related Table ... 143
Getting Multiple Values from a Related Table ... 143
Filtering Multiple Values from a Related Table ... 144
Using the Recursive Functions ... 145
Using Other Functions ... 146
Next Steps ... 147

7 Building Pivot Tables ... 149

Elements of a Pivot Table ... 149
Arranging Field Headings to Build a Report ... 150
Using the PowerPivot Field List to Create Reports ... 150
Building a Pivot Table ... 152
A Look at the Underlying Data ... 152

Defining the Pivot Table 153
Using the Report Filter 159
Report Filters Versus Slicers 161
Explanation of Column B 162
Returning the Column Labels to Sanity 164
New Trick with Column Labels 164
Is There a Way to Permanently Sack the Compact Layout? 165
Two Important Rules with Pivot Tables 166
Pivot Tables Do Not Recalculate When Underlying Data Changes 166
You Cannot Move or Change Part of a Pivot Table 167
Working with Pivot Charts 169
Behind the Scenes with PowerPivot Field List and Add-In 172
Next Steps 173

8 Cool Tricks Native to Pivot Tables 175

Applying Sorting Rules to Pivot Tables 175
Presenting Customers with the Largest Sales at the Top 175
Adding a Custom List to Control Sort Order 179
Showing the Top Five Customers 182
Notes About the Top 10 Filter 183
Changing the Calculation in the Pivot Table 184
Easiest Way to Force a Count 184
Using Sum, Count, Min, Max, or Average 185
Changing the Show Values as Drop-Down 187
Base Fields and Base Items 188
Pivot Table Formatting 190
Change the Numeric Formatting for a Field 190
Formatting Changes on the Design Tab 192
Not Enough Styles? Multiply by 20 194
Applying Data Visualizations and Sparklines 195
Next Steps 197

9 Cool Tricks New with PowerPivot 199

Building a Report with Two Pivot Charts 200
Chart Formatting Changes 202
Adding Slicers and Understanding Slicer AutoLayout 203
Cannot Directly Change the Size of Slicers 204
Controlling the Size of the Bounding Rectangle 206
Strategy for Dealing with AutoLayout of Slicers 208
Adding a Pivot Chart to an Existing Layout 208
Hooking the New Pivot Chart Up to the Existing Slicers 210
Moving the Pivot Table to a Back Worksheet 211
Adding a Pivot Table to an Existing Layout 212
Can the PowerPivot Layout Be Skipped Entirely? 213

Next Steps ... 215

10 Using DAX for Aggregate Functions ... 217

DAX Measures Are Calculated Fields for the Values Area of a Pivot Table ... 218
Five of the Six Pivot Table Drop Zones Are Filter Fields! ... 219
DAX Measures Respect the Home Table Filters ... 220
Generate a Count Distinct ... 220
Using the DISTINCT Function ... 220
Using COUNTROWS as a Wrapper Function ... 221
Entering a DAX Measure ... 222
DAX Measures Are Calculated Only on Demand ... 225
DAX Measures Can Reference Other DAX Measures ... 225
Using Other DAX Functions That Respect Filters ... 226
Denominators Frequently Need to Ignore the Filters ... 228
DAX Calculate Function Is Like the Excel SUMIFS Function ... 228
In DAX, a Filter Might Give You More Rows Than You Started With! ... 230
ALL Function Says to Ignore All Existing Filters ... 231
CALCULATE Is So Powerful, There Is a Shortcut ... 234
Using the FILTER Function ... 234
The Double Negative of AllExcept ... 237
Other DAX Functions ... 238
Next Steps ... 240

11 Using DAX for Date Magic ... 241

Using Time Intelligence Functions ... 242
Fiscal Quarters and Calendar Quarters ... 244
Using Period-to-Date Calculations ... 245
Comparing Today's Sales to Yesterday ... 245
Comparing Today's Sales to One Year Ago ... 245
Reporting Sales for the Full Month ... 246
Calculating Sales for the Previous or Next Month, Quarter, Year ... 247
Sales for the Last 30 Days ... 247
Using Date Functions for Data Reported at a Monthly Level ... 248
Use Care with ParallelPeriod ... 248
Opening and Closing Balances ... 249
Skip the CALCULATE Function in Three Cases ... 249
Next Steps ... 250

12 Named Sets, GetPivotData, and Cube Formulas ... 251

Defining Territories with Named Sets ... 251
Correcting the Grand Total Row in Named Sets ... 254
Using Named Sets for Asymmetric Reporting ... 256
Preserving Report Formatting Using GetPivotData ... 258
Producing a Perfectly Formatted Shell Report ... 259
Evaluating the Formula Built by Excel ... 261

Converting Live Pivot Table to Cube Formulas 263
Customizing the Formatted Report 265
Next Steps 266

13 Final Formatting: Making the Report Not Look Like Excel 267

Charts Should Have Less Ink, More Information 267
Component Charts Make Great Pie Charts 268
Time Series Charts Should Be Columns or Lines 268
Category Charts Make Great Bar Charts 269
Use Descriptive Titles 269
Single-Series Column and Bar Charts Do Not Need Legends! 271
Reduce the Number of Zeros on the Values Axis 271
Slicers Make the On-Chart Controls Obsolete 272
Replace Pie Chart Legends with Labels 273
Gridlines, Tick Marks, Axis, and Column Widths 273

Trying to Tame the Slicers 276
Change the Slicer Color 278

Remove Excel Interface Elements 279
Hide the Gridlines 279
Hide Other Interface Elements 279
Hide the PowerPivot Field List 280

Making a Report Look Like a Dashboard 280
Change the Background Color 280
Contrast Color and Title in Row 1 280
Minimize the Ribbon 281
Micro-Adjust the Zoom Slider 281
Add a Row of Color at the Bottom of the Dashboard 281
Hide the Cell Pointer Behind a Slicer 281

Adding a Picture as a Top Banner 282
Next Steps 284

14 Upgrading to PowerPivot Server 285

Requirements to Run the Server Version of PowerPivot 285

Benefits of the PowerPivot Server 286

How the Report Looks in the Server 287

The Report Gallery Is Slick 288

Why the IT Department Will Embrace PowerPivot 291

Mistakes to Avoid When Publishing Reports to SharePoint 292
Always Add Interactivity 293
Always Select Cell A1 Before Saving a Workbook 293
Pictures Will Not Render on the Server 293
Hide All but the Main Worksheet 293
Whatever Is Not Hidden in Excel Shows Up in SharePoint 294
Next Steps 294

Appendix A: More Resources 295
More PowerPivot Resources 295
Resources from Inside Microsoft 295
PowerPivot Team Blog 295
Rob Collie's PowerPivotPro.com 296
Donald Farmer's Twitter Feed 296
Dave Wickert Is the PowerPivot Geek 296
PowerPivot Twins Write About PowerPivot Best Practices 296
Resources from Outside Microsoft 296
The Great PowerPivot FAQ 296
Kasper de Jonge's Business Intelligence Blog 296
Articles and a Forum at PowerPivot-Info 297
Add-Ins for PowerPivot 297
Index 299

Dedication

To Mark Hauser, for trusting me to be a data analyst. We would have thought we were in heaven if we had PowerPivot way back then.

About the Author

Bill Jelen, Excel MVP and the host of MrExcel.com, has been using spreadsheets since 1985, and he launched the MrExcel.com website in 1998. Bill was a regular guest on Call for Help with Leo Laporte and has produced more than 1,200 episodes of his daily video podcast, Learn Excel from MrExcel. He is the author of 30 books about Microsoft Excel and writes the monthly Excel column for *Strategic Finance* magazine. You will most frequently find Bill taking his show on the road, doing half-day Power Excel seminars wherever he can find a room full of accountants or Excellers. Before founding MrExcel.com, Jelen spent 12 years in the trenches working as a financial analyst for finance, marketing, accounting, and operations departments of a $500 million public company. He lives near Akron, Ohio, with his wife, Mary, Ellen and his sons, Josh and Zeke.

Acknowledgments

Rob Collie moved to Cleveland, Ohio, in 2009. Rob is one of the project managers on the PowerPivot team. If you've ever lived in Cleveland, you understand the words "snow belt" and "lake effect snow." Sitting on the southern coast of Lake Erie, Cleveland is one of five places in the world to experience lake effect snow. There is a section of Cleveland, on the leeward side of Lake Erie where the snowfall triples. As well as Clevelanders understand Mr. Jingaling, we've lived with the words "expect 2 inches of snow overnight, 8 inches in the snow belt." Of course, Rob relocated to the heart of the snow belt and is probably cursing Cleveland as I write this. However, for me, being the guy writing the first book about PowerPivot, having Rob, one of the most knowledgeable guys about PowerPivot, move into practically my backyard was an amazing coincidence. Thanks to Rob for many lunches where he talked about the vision and the reasoning behind PowerPivot. Did I mention Rob spent several years as a project manager on the Excel team? When my head was spinning with DAX formulas, we could always go back to the comfortable territory of why Excel does something bizarre. Thanks to Rob and Jocelyn for happening to end up in Cleveland during the writing of this book.

Thanks to David Gainer for laying the groundwork for Excel 2010 and for sending that e-mail saying that Rob was moving to Cleveland.

On the SQL Server Analysis team, Donald Farmer, Howie Dickerman, and Amir Netz have been tremendously helpful.

Thanks to Dan Bricklin and Bob Frankston for inventing the computer spreadsheet. Thanks to Mitch Kapor for Lotus 1-2-3.

Here are a few new names to thank: Bob Frankston's brother, Charles Frankston, went to work for another Cambridge start-up. In 1985, Charles, along with Rob Firmin, Stan Kugell, Christopher Herot, Arye Gittleman, John Levine, Louise Cousins, and Peter Pathe, developed some software called Javelin. In 1985, Javelin and Microsoft Excel 1.0 were nominated for InfoWorld's Product of the Year. In a close battle, Javelin won. The concepts debuted in Javelin went on to be used in Lotus Improv and went on to be used in Excel pivot tables. Now—the Microsoft Excel team has expanded pivot tables way beyond the capabilities of Javelin and Improv. But, as the PowerPivot team takes Pivot Tables to unimaginable heights, the original Javelin team deserves a tip o' the cap.

Like everyone else who uses computers to make a living, I owe a debt of gratitude to these three pioneers.

I've learned that when writing five books, there is not much time for anything else. Thanks to Tracy Syrstad, Barb Jelen, Schar Oswald, and Scott Pierson for keeping MrExcel running while I wrote. As always, thanks to the hundreds of people answering 30,000 Excel questions a year at the MrExcel message board. Thanks to Wei Jiang and Jake Hildebrand for their programming expertise.

At Pearson, Loretta Yates is an awesome acquisitions editor. If you have ever written a book for any other publisher, you are missing out by not working with Loretta Yates. Bob Umlas is the smartest Excel guy that I know, and I am thrilled to have him as the technical editor for this book.

Finally, thanks to Josh Jelen, Zeke Jelen, and Mary Ellen Jelen. In particular, it was Mary Ellen who realized that things had to change if I were going to get the books done on time.

We Want to Hear from You!

As the reader of this book, you are our most important critic and commentator. We value your opinion and want to know what we're doing right, what we could do better, what areas you'd like to see us publish in, and any other words of wisdom you're willing to pass our way.

As an associate publisher for Que Publishing, I welcome your comments. You can email or write me directly to let me know what you did or didn't like about this book—as well as what we can do to make our books better.

Please note that I cannot help you with technical problems related to the topic of this book. We do have a User Services group, however, where I will forward specific technical questions related to the book.

When you write, please be sure to include this book's title and author as well as your name, email address, and phone number. I will carefully review your comments and share them with the author and editors who worked on the book.

Email:
feedback@quepublishing.com

Mail:
Greg Wiegand
Associate Publisher
Que Publishing
800 East 96th Street
Indianapolis, IN 46240 USA

Reader Services

Visit our website and register this book at www.informit.com/title/9780789743152 for convenient access to any updates, downloads, or errata that might be available for this book.

This page intentionally left blank

Introduction

I am a PowerPivot FanBoy.

I remember the exact moment that this happened. Once a year, Microsoft invites all of their MVPs to Redmond, Washington, for the MVP Summit. The event consists of two days of executive keynotes and two useful days spent with the project managers of your individual technology. I always go to the MVP Summit, looking forward to spending time with the Excel project managers. During those two days, you go from meeting to meeting on the Redmond campus, hearing about various plans for the next version of Excel.

On Wednesday of the 2009 Summit, the noon meeting was not in the usual building 33 that houses the Excel team. As I walked into that room in another building, I noticed something strange. The left side of the room was filled with people I knew: the Excel MVPs. They are people whom you know of if you read Excel books or if you've asked a few questions at the MrExcel.com message board: Curt Frye, Bob Umlas, Richard Schollar, Smitty, Greg Truby. The right side of the room was full of a bunch of people whom I had never seen before. They were eyeing us suspiciously, and we were wondering what the heck they were doing in our meeting.

The speaker that day was Donald Farmer. Scottish. Hair longer than JWalk's. He comes walking in, carrying a desktop PC under his arm. Read that again. He came walking in with a desktop PC. Who shows up to a presentation carrying a desktop PC? Donald set up the PC in the front of the room, plugged it into the projector, and proceeded to start a demo about something called Project Gemini.

IN THIS INTRODUCTION

"There's Row 20 Million"....2

"The PivotTable Field List Has Fields from Both Tables"....2

There Could Be Five Titles for This Book....4

Who *Are* Those Other People in the Room?....5

How This Book Is Organized....7

Conventions Used in This Book....7

"There's Row 20 Million"

Donald Farmer had carried in a 64-bit windows machine with 8GB of RAM. By Christmas of 2009, you could walk into Best Buy and buy such a machine, but I had never seen a machine with more than 3GB of RAM in early 2009.

Donald sets up a scenario. He had two data sets:

- Data set 1 was every DVD rental transaction at a fictitious chain of video stores.
- Data set 2 was box office data that he had downloaded from the Internet.

Donald fires up something that looks basically like Excel and shows us data set 1. He grabs the vertical scrollbar on the right side of the data and starts to scroll. Like a hot knife through butter, the PC responded snappily and Donald says, "There's row 20 million."

It literally did not sink in with me.

Donald continued...

> "There's row 40 million."
>
> "There's row 60 million."
>
> "There's row 100 million."

I am thinking to myself that it is 2009 and seeing row 1 million in Excel was exciting at the 2006 Summit, but really why is this guy wasting our time showing us that Excel now has a million rows?

Wait. Did. He. Just. Say. 100. Million? I looked at the screen and tried to focus on how many digits were in the row count at the bottom of the screen.

Donald went on to sort 100 million rows. He used the AutoFilter drop-downs to filter 100 million rows.

Here is a guy who carried in a desktop PC and had a 100 million row data set in something that looked like Excel. I decided I better close my Outlook and pay attention.

"The PivotTable Field List Has Fields from Both Tables"

Donald proceeds to build a pivot table from the 100 million rows of data. This seems only natural. What else would you do with 100 million rows of data? Just about any time that I get a data set, my first inclination is to build a pivot table, so making a pivot table makes perfect sense.

There is something weird with the pivot table field list, however. It is listing fields from both table 1 and table 2. Donald is only using data from table 1, though. He adds one of the new slicer filters that we had just learned about the day before.

Then, Donald suggested that we compare rentals by genre with box office receipts by genre.

For all of the Excel people reading this book, a very easy quiz. To mash up the data from Sheet1 with Sheet2 what tried and true method will you have to use?

a. `=VLOOKUP()` functions
b. `=INDEX()` functions
c. Cut and paste
d. `=VABRACADABRA()` function, preferably while waving a magic wand

Of course, the answer is a. A nice set of VLOOKUPs will get the data from one sheet onto another sheet. Although, I cringed, 100 million VLOOKUPs are going to take a long time.

Except Donald didn't knock out a VLOOKUP function.

All he did was clicked a field from table 2 in the pivot table field list. This was an early version of the product and a ToolTip popped up saying "We've inferred a relationship between table 1 and table 2". The box office data was now summarized in the same pivot table as the DVD rental information.

> **NOTE** According to Rob Collie, "stuff that looks good in a demo may not actually work well when real people try to use the product." Microsoft ended up backing off from the automatic relationship detection in favor of giving people some control over setting up a relationship. It is still very easy to do, easier than setting up a VLOOKUP.

Now, I Love VLOOKUPs

To me, there are two kinds of people in the world.

- People who can do a VLOOKUP with their eyes closed
- Everyone else

If you've happened to catch one of my live Power Excel seminars, I usually talk about how I used to be a manager of financial analysis. When we needed to hire financial analysts, the person in Human Resources would ask about what requirements I wanted on the job posting notice. I usually had a single requirement: "Can do VLOOKUPs in their sleep." As long as someone could do VLOOKUPs, everything else would fall into place.

I don't want to sound harsh, but it comes down to this; if you can do VLOOKUPs, you are employable. If you can't do VLOOKUPs, well, you might be employable, just not by *me*.

When Donald Farmer clicked a box next to field from Sheet 2 and Excel produced a pivot table from two worksheets without having anyone enter a VLOOKUP function, that was a game-changer.

Suddenly, hundreds of millions of people who (a) know how to use a mouse and (b) don't know how to do a VLOOKUP are suddenly able to perform jaw-dropping business intelligence analyses. They all might actually be employable, by *me*.

"How Much Will This Cost? Well, the Client Is Free"

It was crazy talk.

Microsoft was demonstrating the greatest invention in a decade and they were giving it away for free.

It wasn't unprecedented. Lotus used to sell Lotus Improv for $199, and Microsoft borrowed all of that technology and gave it away on the Excel data menu back in 1993. Of course, it would have been a blatant rip-off if they would have put "Improv" on Data menu in Excel 5, so they changed the name to something called a "pivot table."

Pivot tables were the greatest computing invention since VisiCalc, and Microsoft bundled that for free with their Excel product.

I was watching the greatest computing invention since pivot tables, and now Microsoft was planning on bundling it for free with Excel 2010.

This Book Was Pitched Eight Hours Later

Based on the two facts: (a) 100 million rows in Excel and (b) a pivot table from multiple worksheets without a VLOOKUP, I knew that I wanted to write a book about this new product. Loretta Yates from Que was in town for the MVP Summit, and I had tentative approval for this new book less than eight hours after I saw the product.

There Could Be Five Titles for This Book

Any one of these mega-benefits would make PowerPivot worthy of a book:

- *100 Million Rows: Miracle Product Allows Unlimited Rows in Microsoft Excel!*
- *VLOOKUPs Shrugged: Why You Don't Need VLOOKUPs Any More*
- *ATOM & CSV: The Marriage of Disparate Data*
- *L.Y. Actuals & C.Y. Budget: How Named Sets Enabled the Obvious But Previously Impossible Pivot Table Report*
- *Calculated Fields: Designed by an Intern? How DAX is Empowering Real Calculations in Pivot Tables*

This sixth title might not appeal to the Excel audience, but would make a great whitepaper:

- *Store It Columnwise, Stupid! How to achieve world-class data compression*

At that first meeting with Donald Farmer, only the first two points really sunk in with me. (1) They had busted through the one million row limit in Excel. (2) You could join Sheet1 and Sheet2 without VLOOKUP.

There are other benefits to PowerPivot that I did not begin to understand until I was working on these books, including the following:

- PowerPivot can consume data from many places and present them all in the same workbook. You can have low-tech data like flat text files. You can have data coming from SQL Server. You can have data from Excel. Data from Access. RSS feeds.
- All pivot tables are lousy at handling asymmetric reports. If you try to show last year's sales and this year's budget in the same pivot report, you are going to have to endure having last year's budget and this year's actuals in the report, too. This means you will manually be hiding some columns and replacing the built-in total column with your own column. The Excel team fixed this in Excel 2010, but only for people reporting from OLAP data sets. Here is the funny thing about PowerPivot: It makes regular Excel data into OLAP data sets. Saying that you want to use PowerPivot just to enable asymmetric reporting is like saying that you want to use a $100 million laser to heat up your coffee. It is a huge underutilization of a $100 million laser. But...the fact is that the laser will heat up coffee, and you've frankly been living without a microwave since 1993 when the first pivot table hit Excel. So, if you have a need to report last year's actuals next to this year's budget, well, PowerPivot is going to enable this for you.
- Calculated fields in pivot tables were always sort of quirky. They would work for simple things. When you see how the new DAX formula language enables you to do really powerful things with calculated measures in PowerPivot, you will realize that calculated fields can't hold a candle to these new calculations.

Any one of those benefits should be enough to get the Excel data analyst to want to upgrade to Excel 2010. Put all of the benefits into a single product, and price that product at the price of $Free and there will be a lot of Excel people who should be drooling.

To see a demo of the benefits of PowerPivot, search for PowerPivot Data Analyst 1 at YouTube.

Who *Are* Those Other People in the Room?

There are at least three audiences who are watching PowerPivot with great interest:

- **There is us. You know us:** You. Me. Excel people. We do everything in Excel. We think that Microsoft Word is a useless add-in for people who can't manage to use Edit, Fill, Justify. We are the front lines of the decision-making process.
- **There are SQL Server people:** They are the people who are sitting on top of 100 million rows of transactional data. They are the people who get us the nice and tidy one million row summaries of the transactional data. (Between you and me, if they embrace PowerPivot and just let us get to that 100 million rows of transactional data, we can actually run a few different iterations before we figure out what data we actually need.)

- **There are SharePoint people:**SharePoint people keep talking about having "one version of the truth" and it is stored in SharePoint. The SharePoint people like PowerPivot because if you and I design a cool report in PowerPivot, we can publish it to SharePoint and that helps to justify why the company needs SharePoint.

I have to tell you, it is a little bit uncomfortable being in the same room with all these people because frankly, our relationship had been a little adversarial over the years.

PowerPivot is in a sweet spot between these three groups.

The SQL Server people will actually have less requests from the Excel people. Get us the data and we will slice and dice it.

The SQL Server people feel like they have more control because they get to make sure that the original link to the data is to data that they bless. Also, the relationships in PowerPivot help to make sure that the Excel people don't screw up the data.

The Excel people can iterate over various attempts at producing reports without having to go back to the SQL Server people in IT. It gets expensive buying a dozen chocolate Krispy Cream donuts every time you need a new report from the IT department.

For the Excel people, if the SharePoint people will host our reports, we've secretly offloaded the need to refresh the report every night because the SharePoint people can schedule a nightly refresh. That means that we can spend a week at the beach without having to dial in every morning to run the reports.

For the SharePoint people, you can see which reports are being accessed and by whom. Those Excel people create a boatload of reports and there are probably two or three that are actually used by the big important people in the company. With SharePoint, you can see which reports are actually getting traffic and thus know which reports you should (a) make sure don't go down, and (b) know which reports are good candidates for turning into other systems.

This Book Is For The Excel People

I have configured exactly one SharePoint server in my lifetime, and that was with a lot of hand holding from a write-up by Vidas Matelis on the Web. I've installed SQL Server three times, and only two of those installations were successful. (I still can't figure out what I did wrong with the third installation.)

If you are a SharePoint person or a SQL Server person, I don't have a clue about the things you are talking about. I know that you both have an interest in PowerPivot, and I hope that Rob Collie or someone writes a book for you. My goal is to get those Excel people up to speed with PowerPivot. I realize that the three groups of people can have a great symbiotic relationship with PowerPivot. I hope to deliver the Excel masses to your door, clamoring for access to your SQL Server data and your SharePoint servers.

How This Book Is Organized

I am writing this book for the Excel audience (the 500 million people who use Excel day in and day out). All but one chapter will be focused on using the PowerPivot client inside of Excel 2010.

The first two chapters gets PowerPivot installed and show you what is possible with PowerPivot.

Chapter 3 takes a look at the upsides and downsides to using PowerPivot.

Chapters 4 through 6 cover how to get your data into PowerPivot, how to define relationships, and how to work with data before it becomes a pivot table.

Chapters 7 through 9 deal with the process of creating and using pivot tables with PowerPivot.

Chapters 10 and 11 deal with the really powerful ways to use Data Analysis Expression (DAX) measures.

Chapters 12 and 13 cover how to format your PowerPivot reports.

Chapter 14 identifies the benefits of using the server version of PowerPivot.

The appendix offers a list of additional resources.

Conventions Used in This Book

The special conventions used throughout this book are designed to help you get the most from the book as well as Excel 2010.

Text Conventions

Different typefaces are used to convey various things throughout the book. They include those shown in Table I.1.

Table I.1 Typeface Conventions

Typeface	Description
`Monospace`	Screen messages and web addresses appear in `monospace`.
Italic	New terminology appears in this *italic*.
Bold	References to text you should type appear in **bold**.

Tab names on the Ribbon, dialog box names, and dialog box elements are capitalized in this book (for example, Add Formatting Rule dialog, Home tab).

In this book, key combinations are represented with a plus sign. If the action you need to take is to press the Ctrl key and the T key simultaneously, the text tells you to press Ctrl+T.

There were not many changes from Excel 97 to Excel 2000 to Excel 2002 to Excel 2003. Most people upgrading to Excel 2010 will be coming from one of these versions of Excel. I collectively refer to these versions as "Legacy versions of Excel."

Special Elements

Throughout this book, you'll find tips, notes, cautions, cross-references, and case studies. These elements provide a variety of information, ranging from warnings you shouldn't miss to ancillary information that will enrich your Excel experience but isn't required reading.

NOTE

Tips point out special features, quirks, or software tricks that will help you increase your productivity with Excel 2010.

TIP

Notes contain extra information or alternative techniques for performing tasks..

CAUTION

Cautions call out potential gotchas.

In most chapters, a YouTube video demo will be available for one topic.

Cross References

→ **See** Chapter 9, "Cool Tricks New with PowerPivot," for more information.

CASE STUDY: OTHER ELEMENTS

Case studies are set off in boxes such as this one:

Case studies walk you through the steps to complete a task.

Sidebars

Historical glimpses and other information that is not critical to your understanding appear as sidebars. I imagine that if the Cliff Claven character from *Cheers* knew a lot about Excel, these would be the kinds of things he would write.

The Promise of PowerPivot

2

IN THIS CHAPTER

Preparing Your Data for PowerPivot 17
Getting Your Data into PowerPivot..... 18
Define Relationships 23
Add Calculated Columns Using DAX..... 25
Build a Pivot Table..... 26
World-Class Data Compression..... 31
Asymmetric Reporting with PowerPivot 33

This chapter walks you through one process of building a PowerPivot report. You will learn how simple it is to merge data from two sources in a single PowerPivot pivot table.

You can download these data sets from http://www.MrExcel.com/powerpivotbookdata.html.

Before trying these steps in this chapter, make sure that you have installed the PowerPivot client in Excel 2010 as described in Chapter 1, "Downloading and Installing PowerPivot."

Preparing Your Data for PowerPivot

If you are using your own data in PowerPivot, you need to ensure that your data is formatted appropriately. PowerPivot can deal with many different types of data. But unfortunately, people and software vendors do a lot of weird stuff with their data.

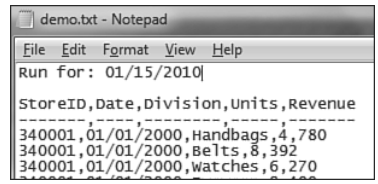
One of my favorite large data sets comes from a cash register vendor. They produce these large 1.8 million row data sets as flat text files and send them to my client every day.

In Figure 2.1, you can see the top of the data set. Row 1 contains the words "Run for:" and the date. Row 2 is blank. Row 3 has headings. Row 4 has underscores. Seriously? Underscores? Who are those really for?

PowerPivot cannot deal with three of those first four rows. PowerPivot can deal with the field headings, but the Run For, the blank row, and the underscores have to go. This either means a request sent to the software vendor or a daily trip through Notepad to delete those rows.

If you want PowerPivot to treat a column as a date column, then 100% of the values in that column

Figure 2.1
PowerPivot has no problem with 1.8 million rows, but it can't deal with the extra rows at the top.

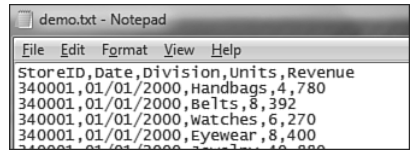


have to be dates. This same vendor loves to use dates of **/**/**** for new items that are not yet in inventory.

The point is that any date is going to have strange characteristics that you will have to deal with. Work the IT department or your vendor to get the data cleaned up for PowerPivot.

In Figure 2.2, removing three headings solves the problem.

Figure 2.2
One row of headings, followed by data records.



If your data is in Excel, you want to follow the same format. One row of headings followed by data rows. No blank columns. No blank rows. Make sure that any date columns are 100% filled with dates.

In the text file, there is only a store number. It would be nice to add store name, region, and so on. In Figure 2.3, a small 150-row data set provides information about each store.

Figure 2.3
Identifying information for each store.

	A	B	C	D
1	Store	Selling_SF	Mall Developer	Store Name
2	340001	603	Westfield	Main Place Mall
3	340002	654	Westfield	Sherman Oaks Fashion Squa
4	340003	998	Simon Property Group	Brea Mall
5	340004	858	General Growth Properties	Park Place
6	340005	746	Westfield	Galleria at Roseville
7	340006	1633	Simon Property Group	Mission Viejo Mall

Getting Your Data into PowerPivot

In this example, you will be importing two different data sets into PowerPivot. You will be importing the text file. For the Excel data about the stores, you can either copy and paste into PowerPivot, or define a table and link it to PowerPivot. For this example, a simple copy and paste will work.

→ **See** Chapter 4, "Getting Your Data into PowerPivot," for details on using the linked table method.

Decide on a Sequence for Importing

You should import the main transaction table first. In this case, the main transaction table is the 1.8 million row file with sales information. After that file is imported, you can import the lookup table information.

You should follow this sequence for two reasons:

- In the PowerPivot Field List, the tables are presented in the order that they were imported. You will want your main table at the top of the list when building pivot tables.
- The PowerPivot relationship detection logic expects the main table to be first.

So, for this example, you will be loading the text file first, and then pasting the stores data into PowerPivot.

Import a Text File

To import the 1.8 million row file into PowerPivot, follow these steps:

1. Select the PowerPivot tab in Excel 2010.
2. Select the PowerPivot Window icon. A new PowerPivot application window will appear. PowerPivot offers two ribbon tabs: Home and Design. The left side of the Home tab is shown in Figure 2.4.

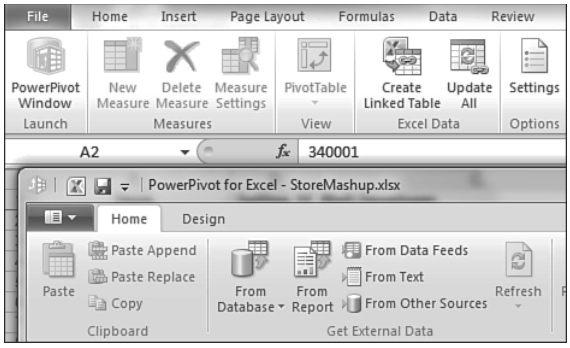


Figure 2.4
The Home tab of the PowerPivot application.

3. You want to import your main table first. This will be the large CSV file shown in Figure 2.2. From the Get External Data group, select From Text. PowerPivot shows the Table Import Wizard (see Figure 2.5).
4. Because your first row of the file contains headers, select the Use First Row as Column Headers check box.
5. Click the Browse button and locate your text file. PowerPivot will pause for a second and fetch the first 50 rows of data from the text file to provide a data preview, as shown in Figure 2.6.
6. If there are any columns that you don't need to import, clear them.

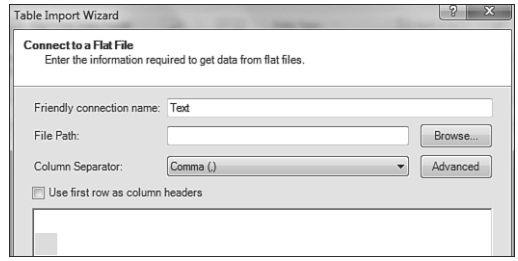


Figure 2.5
Preparing to import a text file.

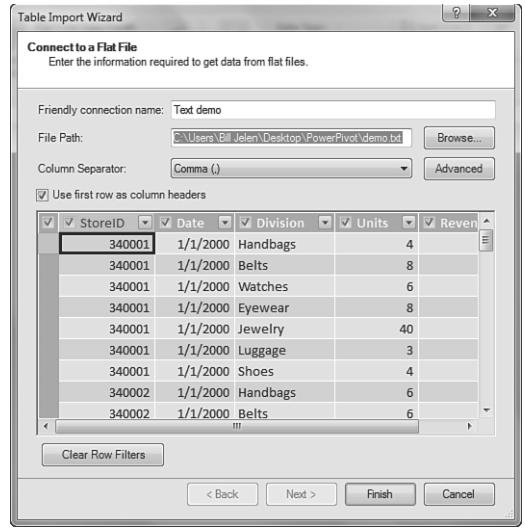


Figure 2.6
PowerPivot provides a 50-row preview.

NOTE

The entire file is going to be read into memory. If you have extraneous columns, particular columns with long text values, you can save memory by clearing them.

7. Note that there are filter drop-downs for each field. You can actually sort and filter this 1.8 million row data set here, although it will be slower than in a few steps from now. If you open a filter field, PowerPivot will scan the entire file to build the list of filters, as shown in Figure 2.7. You can choose to exclude certain values from the import.
8. Click Finish and PowerPivot will begin loading the file into memory. The wizard will show how many rows have been fetched so far (see Figure 2.8). Loading data can take a long time. If you would need to interrupt the import, the Stop Import button is available at the bottom of the wizard.
9. When the file is imported, the wizard confirms how many rows have been imported, as shown in Figure 2.9. Click Close to return to the PowerPivot window.

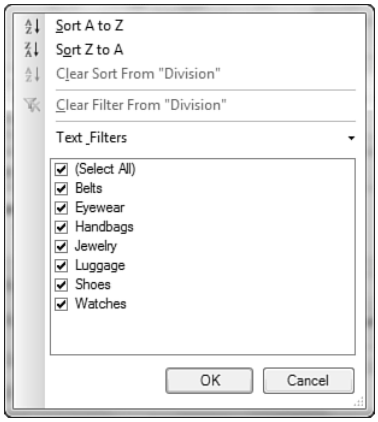


Figure 2.7
To conserve file size, you can choose to exclude certain divisions from the import.

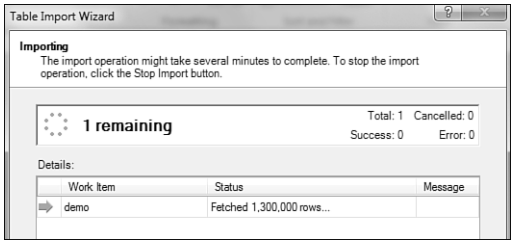


Figure 2.8
PowerPivot provides an update on how the import is progressing.

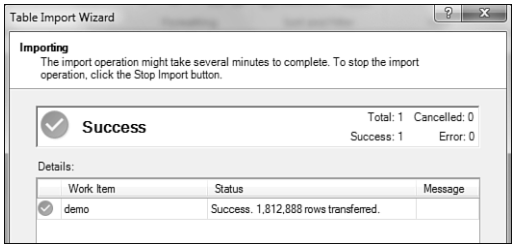


Figure 2.9
These 1.8 million rows are now stored in your Excel file.

10. The 1.8 million row data set is shown in the PowerPivot Window. Go ahead. Grab the vertical scrollbar and scroll through the records. You can also sort, change the number format, or filter (see Figure 2.10).

To see a demo of importing data, search for PowerPivot Data Analyst 2 at YouTube.

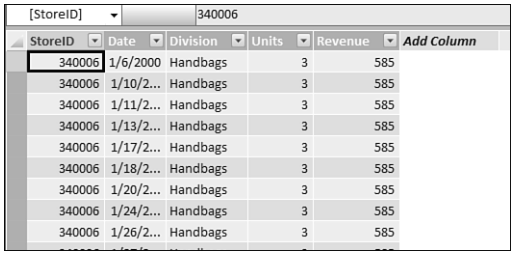


Figure 2.10
1.8 million records are in a grid that feels a lot like Excel.

> **NOTE** Note that although this feels like Excel, it is not Excel. You cannot edit an individual cell. If you add a calculation in what amounts to cell F1, that calculation will automatically get copied to all rows. If you format the revenue in one cell, all of the cells in that column will get formatted. You can change column widths by dragging the border between the column names just like in Excel.

The filters in PowerPivot are not as powerful as the new filters introduced in Excel 2007. In particular, the date columns do not show a hierarchical filter where you can choose a year or month.

If you right-click a column heading, a menu appears where you can rename, freeze, copy, hide, unhide the columns (see Figure 2.11).

Bottom line: You have 1.8 million records that you can sort, filter, and later, pivot. This is going to be cool.

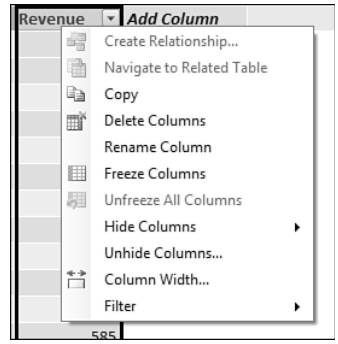


Figure 2.11
Right-click a column to rename it.

Add Excel Data by Copying and Pasting

Next, you want to add your store information to PowerPivot. As mentioned previously, you could either link to the Excel data or copy and paste. For this example, a simple copy and paste will work.

→ **See** Chapter 4 for more information on linking.

To return to the Excel workbook from PowerPivot, you can press Alt+1 or click the tiny Excel icon at the top left of the PowerPivot window (see Figure 2.12).

1. Open the StoreInfo.xslx file in Excel.
2. Select the data with Ctrl+*.
3. Copy it with Ctrl+C.
4. Click the PowerPivot Window icon. PowerPivot returns and you see your 1.8 million row data set.

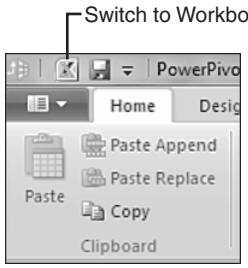


Figure 2.12
Use this icon to return to your Excel workbook.

5. Click the Paste icon on the left side of the PowerPivot Home tab. You will see a Paste Preview window.
6. Give the new table a better name than Table. Perhaps StoreInfo (see Figure 2.13). Click OK.

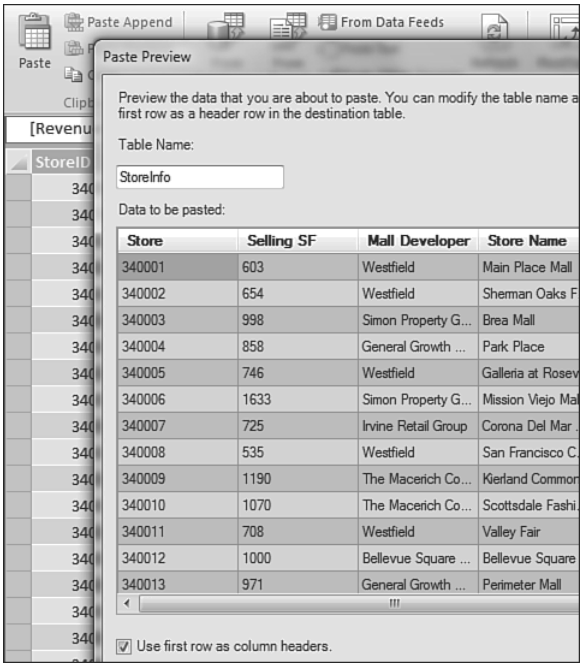


Figure 2.13
Give the pasted table a name.

You will now see the store information in a new StoreInfo tab at the bottom of the screen. Notice that there are now two worksheet tabs in PowerPivot, as shown in Figure 2.14.

Define Relationships

Normally, in regular Excel you would be creating VLOOKUPs to match the two tables. It is far easier in PowerPivot. Follow these steps:

Figure 2.14
You now have two unrelated tables in the PowerPivot window.

1. You will be linking from one column in your main table to a column in another table. To simplify the relationship process, navigate to your main table and select a cell in the column from which you will be linking.
2. Click the Design tab in the PowerPivot Ribbon.
3. Select Create Relationship. The Create Relationship dialog appears. By default, the selected table and column will appear in the first two fields, as shown in Figure 2.15.
4. If you skipped step 1 and the correct table is not shown in the Table drop-down, then select Demo from the Table drop-down.

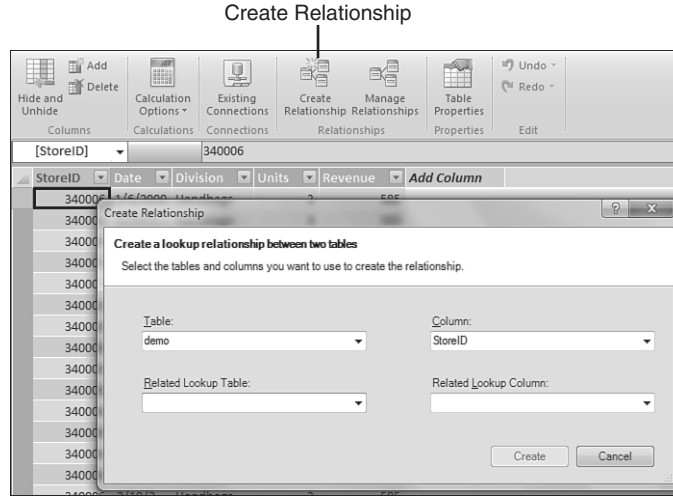


Figure 2.15
Define a relationship between tables. By selecting the key column before starting, 2 of the 4 fields are populated.

5. If you did not select the correct column in step 1, open the Column drop-down. Select StoreID.
6. Open the Related Lookup table drop-down. Select StoreInfo.
7. Open the Related Lookup Column drop-down and select Store (see Figure 2.16).

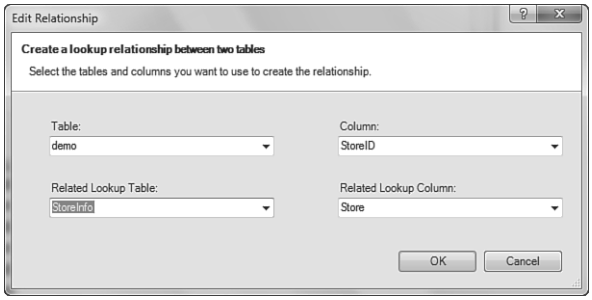


Figure 2.16
This simple dialog replaces the VLOOKUP.

8. Click Create. You've now created a relationship between the two tables.

Add Calculated Columns Using DAX

One downside to pivot tables created from PowerPivot data is that they cannot automatically group daily data up to years. Before building the pivot table, let's use the Data Analysis Expression (DAX) formula language to add a new calculated column to the Demo table.

Follow these steps to add a Year field to the Demo table:

1. Click the Demo worksheet tab at the bottom of the PowerPivot Window.
2. The column to the right of Revenue has a heading of Add Column. Click in the first cell of this blank column.
3. Click the fx icon to the left of the formula bar. The Insert Function dialog appears with categories for All, Date & Time, Math & Trig, Statistical, Text, Logical, and Filter. Select Date & Time from the drop-down. You will instantly notice that this is not the same list of functions in Excel. Five of the first six functions that appear in the window are exotic and new (see Figure 2.17).
4. Luckily, some familiar old functions are in the list as well. Scroll down and select the YEAR function. Click the first date in the Date column. PowerPivot proposes a formula of `=year(demo[Date]`. Type the closing parentheses and press Enter. Excel will fill in the column with the year associated with the date, as shown in Figure 2.18.
5. Right-click the column and select Rename Column. Type a name, such as Year.
6. Repeat the process to add a Month column using a formula of `=Month(demo[Date])`. Figure 2.19 shows the table after adding two columns.

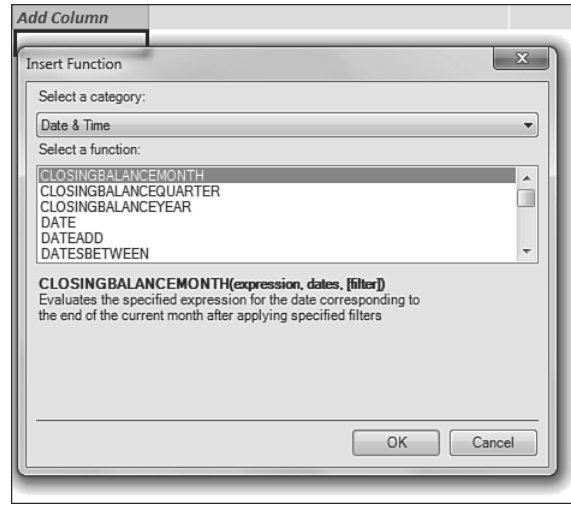


Figure 2.17
DAX offers a different list of functions than Excel.

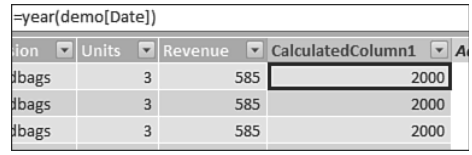


Figure 2.18
A new calculated column is added. You will want to rename this.

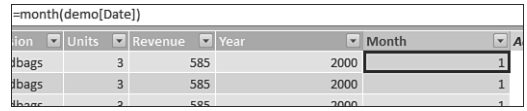


Figure 2.19
You now have years and months.

TIP

The language used to create that column is called DAX. There are two types of calculations that you can do with DAX. Figure 2.19 shows a DAX calculation in the data grid. A more powerful type of DAX calculation is adding a DAX Measure to a pivot table.

→ **See** Chapter 10, "Using DAX for Aggregate Functions" and Chapter 11, "Using DAX for Date Magic," for more information on DAX.

There are many more columns that you might think of adding, but let's move on to using the pivot table.

Build a Pivot Table

One of the advantages of PowerPivot is that multiple pivot tables can share the same data and slicers. Open the PivotTable drop-down on the Home tab of the PowerPivot Ribbon.

As shown in Figure 2.20, you have choices for a single pivot table, a single chart, a chart and a table, two charts, four charts, and so on.

→ To read more about layouts with multiple elements, **see** Chapter 7, "Building Pivot Tables."

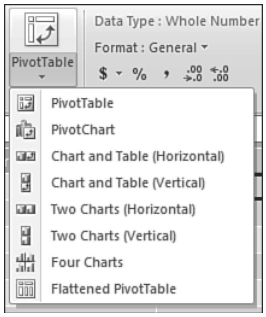


Figure 2.20
You have many options beyond a single table or chart.

Follow these steps:

1. Select PivotTable. You now see the PowerPivot tab back in the Excel window.
2. Choose to put the pivot table on a new worksheet (see Figure 2.21).

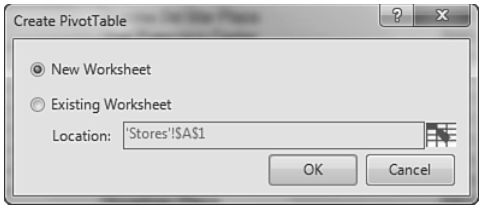


Figure 2.21
Choose the location for the pivot table.

There are many things to notice. The icon for a blank pivot table occupies cell B3:D20. This allows room for slicers to go above and left of the pivot table (see Figure 2.22).

Docked on the right side of the screen is the PowerPivot Field List. This is now a third variation of the PivotTable Field List.

NOTE

Excel already offers two different field lists, one for OLAP data sets and one for PivotCache data sets. Figure 2.23 shows the PowerPivot Field List.

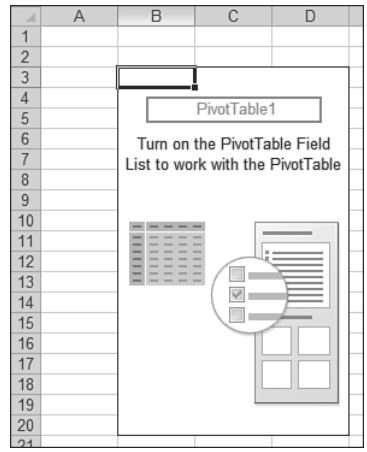


Figure 2.22
The blank pivot table icon appears in B3.

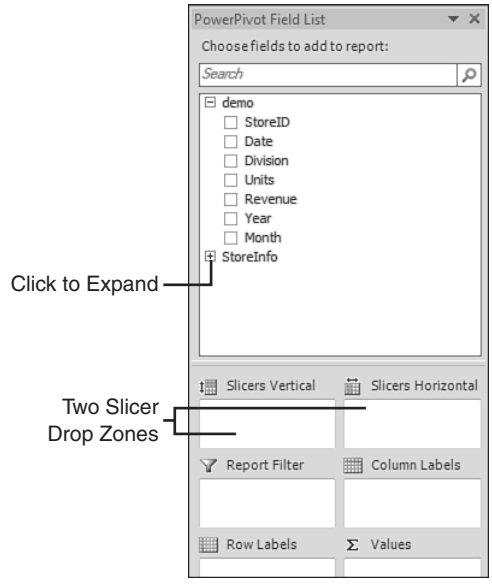


Figure 2.23
The PowerPivot Field List is a third variant of the PivotTable Field List.

Both tables are available in the top of the Field List. The main table is expanded to show the field names, but you can expand the other table and add those fields to this pivot table.

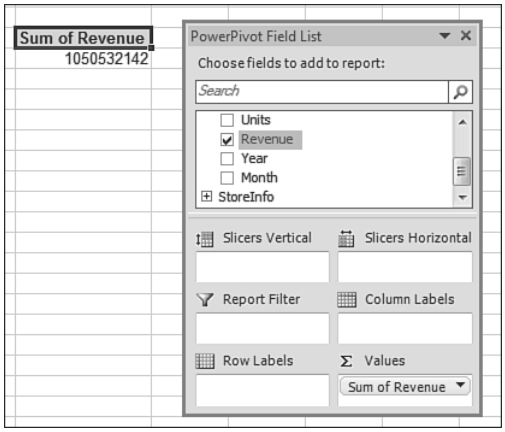
Two new sections in the drop zones offer vertical or horizontal slicers.

> **NOTE** For the purposes of the screen shots in this book, I will undock the PowerPivot Field List and float it near the pivot table. To undock the field list, grab the title bar and drag away from the edge of the screen. To later redock the field list, grab the title bar and drag it more than half way off the right side of the Excel window.

Because you are in a pivot table, the PivotTable Tools tabs are available in the Excel Ribbon.

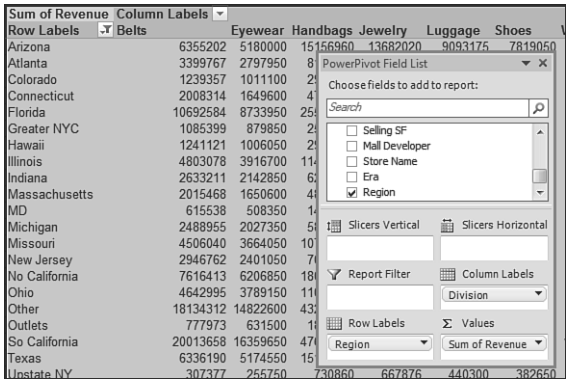
3. Select Revenue from the PowerPivot Field List by adding a check box next to it. Because Revenue is a numeric field, it automatically moves to the Values drop zone at the bottom of the field list. Your pivot table now shows Sum of Revenue, which is the total revenue in the entire 1.8 million row file (see Figure 2.24).

Figure 2.24
Choose a numeric field and Excel sums that field.



4. Expand the StoreInfo table. Select Region from the StoreInfo table. Excel builds a pivot table showing sales by region. At this point, you have a pivot table from 1.8 million rows of data with a virtual link to a lookup table.
5. Drag the Division field from the Demo table to the Column Labels drop zone.Your pivot table is now mashing up data from two different tables (see Figure 2.25).

Figure 2.25
This pivot table summarizes 1.8 million rows and data from two tables.



6. Drag the Store Name field to the Row Labels drop zone. Drop Store Name below the Region field.

To show off some more features of the PowerPivot pivot table, let's add some slicer functionality:

1. Drag Year to the Slicers Vertical drop zone.
2. Drag Month to the Slicers Vertical drop zone.
3. Drag Mall Developer to the Slicers Horizontal drop zone.

To clean up the formatting of the pivot table, follow these steps:

1. Go to the PivotTable Tools Design tab in the Ribbon. Select Banded Rows.
2. On the same tab, open the PivotTable Styles gallery and choose a light, medium, or dark color scheme.
3. Go to the Options tab. The Active Field should say Sum of Revenue. If it does not, choose a numeric cell in the pivot table.
4. Click the Field Settings icon in the PivotTable Tools Options tab.
5. In the lower left corner of the Value Field Settings dialog, select the Number Format button.
6. Select the Number category. Select Use 1000 Separator. Select 0 decimal places (see Figure 2.26). Click OK to close the Format Cells dialog. Click OK to close the Value Field Settings dialog.

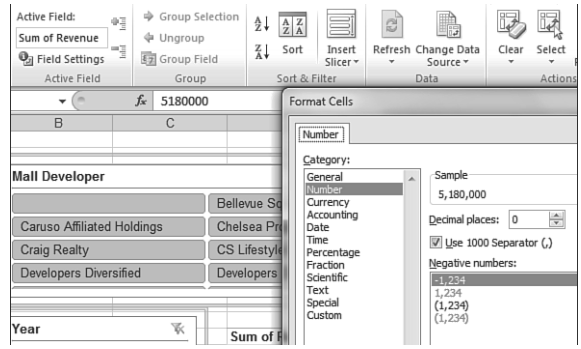


Figure 2.26
The numeric formatting is hidden two levels deep.

The result is an impressive interactive report, as shown in Figure 2.27.

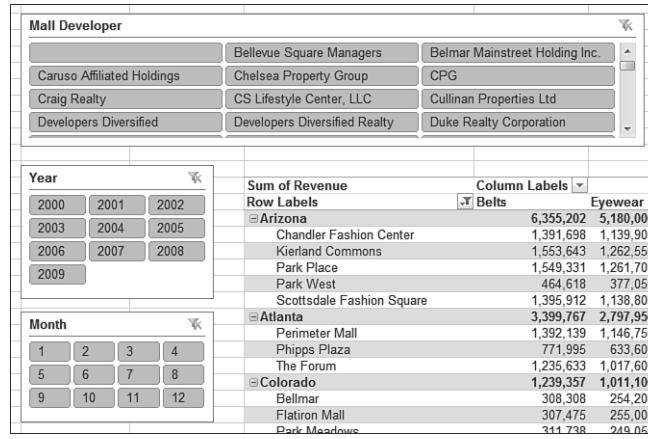


Figure 2.27
The formatted report with some slicers.

7. Select the year 2000 from the Year slicer. The report instantly redraws to show only the stores that were open in the year 2000. The Mall Developer slicer redraws to show only the five developers with whom you had contracts in 2000 (see Figure 2.28).

World-Class Data Compression

When you are creating PowerPivot data sets, all of the data is loaded into computer memory. When you save a PowerPivot workbook, the data from the imported text files is stored in the workbook. Amir Netz from the PowerPivot team came up with an impressive methodology for compressing the data.

Figure 2.28 tells an impressive story. This chapter mashed up a text file that occupies 58MB. It also incorporated the StoreInfo.xlsx file which takes up 19K. All of that data is stored in the StoreMashup.xlsx file in an amazingly small 3.6MB file (see Figure 2.29).

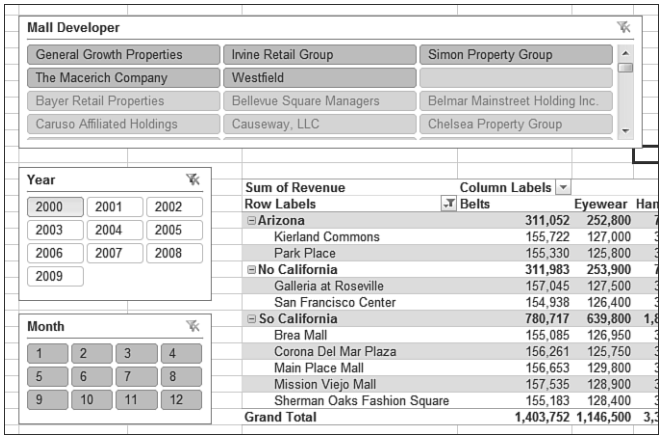


Figure 2.28
Choose a year and the report updates, as well as the other slicers.

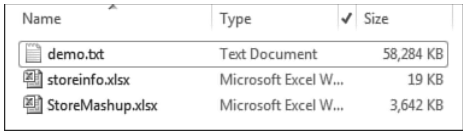


Figure 2.29
58MB of text file fits in a 3.6MB Excel file.

Storing Data Columnwise

When you are storing a database on a medium like a hard drive, it makes sense to keep each record together. Because hard drives are relatively slow, you want that data stored in a contiguous block as shown in Figure 2.30.

	A
1	340017,02/22/2009,Shoes,3,450
2	340018,02/22/2009,Handbags,4,780
3	340018,02/22/2009,Belts,9,441
4	340018,02/22/2009,Watches,4,180
5	340018,02/22/2009,Eyewear,6,300
6	340018,02/22/2009,Jewelry,27,594
7	340018,02/22/2009,Luggage,3,525
8	340018,02/22/2009,Shoes,2,300

Figure 2.30
In a traditional disk-based database, all of the fields for one record are stored in close proximity to each other.

The problem with storing data in a row-wise fashion is that there is little opportunity for compression. In the entire 1.8 million rows of the text file, there are no records that match 100%.

Early on, the PowerPivot team decided that PowerPivot was only going to be dealing with data in memory. Thus, they don't need to store data in a row-wise fashion.

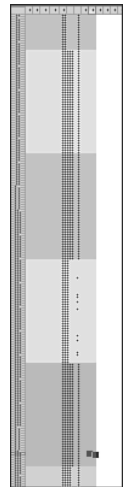
When you start to look at a single column of data, there are many columns with huge amounts of duplicates. For example, 1.8 million rows of category information really only has nine possible values. There are massive numbers of adjacent values that are exactly the same see Figure 2.31).

Figure 2.31
Look at one column of the data, and there are many possibilities for compression.

	D	E	F	G	H	I	J
211	340056		2/22/2009		Luggage		3
212	340057		2/22/2009		Luggage		3
213	340058		2/22/2009		Luggage		4
214	340059		2/22/2009		Luggage		4
215	340060		2/22/2009		Luggage		3
216	340061		2/22/2009		Luggage		2
217	340017		2/22/2009		Shoes		3
218	340018		2/22/2009		Shoes		2
219	340019		2/22/2009		Shoes		3

If you sort the data by category, you really end up with huge rainbow stripes of records that fit in each category (see Figure 2.32). The space to store the entire column of 1.8 million category values comes down to 9 pointers that say everything from this record to this records is "Jewelry."

Figure 2.32
Conceptually, PowerPivot is reducing the data to rainbow stripes of different values in each column.



Microsoft calls this VertiPaq compression. (That is kind of a catchy name, isn't it. Vertical packing of the data. Geeky.)

This is why PowerPivot does not do well with long text values in a column. If you have a comment field, remove that field as you are importing the data to allow PowerPivot to do its full compression.

> **NOTE**
> Microsoft is cautiously saying that they might sometimes see 15X compression. The simple example in this chapter was not designed to compress extremely well, but it does demonstrate a 16X compression factor.

I hate to extrapolate, but if the file size limit is 2GB on disk, and if you could somehow keep up the 16X compression, then that is a theoretical maximum of 32GB of data in a single pivot table. That would be 993 million rows of demo.txt type data. You would have to own a serious computer. 64-bit Windows and 64-bit Office to be sure.

Most of us were limited to 65,536 rows just a year or two ago. Now the simple demo file for this book is 27 times larger than that limit, with a theoretical upper limit that is 15,000 times larger than 65,536 rows. I would gladly personally shell out the full purchase price of the PowerPivot client to get access to that much analytical power.

Asymmetric Reporting with PowerPivot

Asymmetric reporting is not possible with pivot tables that are built from pivot caches of Excel data. In Figure 2.33, a small data set in A1:D37 is used to produce the pivot table in columns G:N.

Figure 2.33
Delete those five columns from the report.

Sum of Revenue	Column Labels						
	FY2009		FY2009 Sum	FY2010		FY2010 Sum	Grand Total
Row Labels	Actuals	Budget		Actuals	Budget		
Arizona	550550	600000	1150550	0	633000	633000	1783550
California	3165104	[illegible]	[illegible]	[illegible]	3666000	[illegible]	[illegible]
Colorado	616097	[illegible]	[illegible]	[illegible]	669000	[illegible]	[illegible]
Louisiana	814431	825000	1639431	0	902000	902000	2541431
Nevada	1170320	1000000	2170320	0	1194000	1194000	3364320
New Mexico	322168	350000	672168	0	370000	370000	1042168
Oklahoma	186715	200000	386715	0	213000	213000	599715
Texas	2559021	2750000	5309021	0	2920000	2920000	8229021
Utah	632897	650000	1282897	0	706000	706000	1988897
Grand Total	10017303	10475000	20492303	0	11273000	11273000	31765303

Out of seven data columns in the report, you don't want to see five of them. You are interested in last year's actuals and this year's forecast. This is not really possible with a regular pivot table.

You could use PivotTable Tools Options, Options, Totals & Filters, and then clear Show Grand Total For Rows to get rid of the grand total in column N.

Then, you can click a year heading in the pivot table, use PivotTable Tools Options, Field Settings and select None for the Subtotals to get rid of two more columns. But then, you are left with no good way to delete 2009 Budget or 2010 Actuals. If you try to filter out the Budget, it will be removed from both years. If you try to delete column I, you will be met with the warning that you cannot Move a Part of A Pivot Table report message (see Figure 2.34).

Option 1 is to use Home, Format, Column, Hide to hide the columns that you don't want to see. Option 2 is to convert the pivot table to values using Copy and then Paste, Paste Values.

With PowerPivot, a third option becomes available. Because data in the PowerPivot window becomes an online analytical processing (OLAP) cube, you have access to OLAP tools, including named sets.

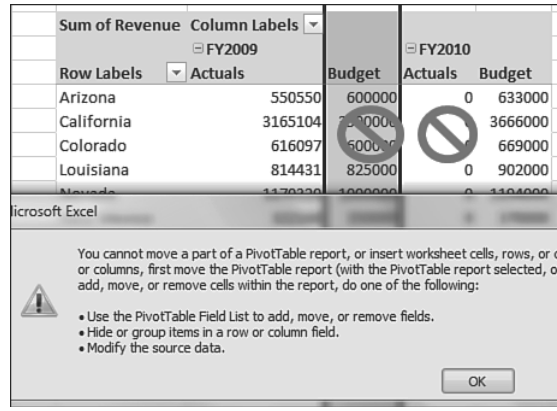


Figure 2.34
You can get close using regular pivot table tools, but then you are shut down.

Follow these steps to create an asymmetric report:

1. Open your regular data set in Excel.
2. Select one cell in the data and press Ctrl+T. Confirm that your data has headings. Click OK. The data is formatted and a new Table Tools Design tab appears. On the left side, the Table Name appears as Table 1. Type a new name, such as Financials.
3. On the PowerPivot tab, select Create Linked Table.
4. In the PowerPivot Window, open the Pivot Table drop-down and select Pivot Table.
5. Choose a location for the pivot table.
6. Select State and Revenue from the Pivot Table Field List. Drag Year and Measure to the Column Labels drop zone.
7. You now have a pivot table that looks identical to the one in Figure 2.33. The difference is that Named Sets are not grayed out anymore on the Options tab.
8. Go to PivotTable Tools Options. Open the Fields, Items, and Sets drop-down. Select Create Set Based on Column Items.
9. Type a set name, such as BudAct. The Display Folder can be blank. Excel shows you the 7 columns currently in your pivot table.
10. Select the row for FY2009 Budget, as shown in Figure 2.35. Click Delete Row.
11. Repeat step 10 for the other four rows that you don't want to show in the pivot table. When you are done, you should see only two rows, as shown in Figure 2.36.
12. Click OK to complete the set.

As shown in Figure 2.37, you will now have a pivot table that will report asymmetric sets of columns.

Next Steps

This chapter showed you what is possible with pivot tables. In the next chapter, you will see both the benefits of the drawbacks of using PowerPivot.

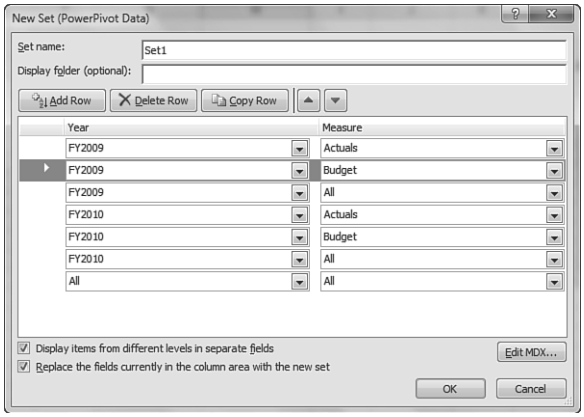


Figure 2.35
Select a pair of values and click Delete.

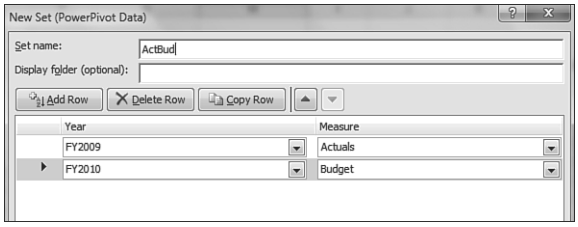


Figure 2.36
Repeat for each item that you want to delete.

Sum of Revenue	Column Labels	
	FY2009	FY2010
Row Labels	Actuals	Budget
Arizona	550550	633000
California	3165104	3666000
Colorado	616097	669000
Louisiana	814431	902000
Nevada	1170320	1194000
New Mexico	322168	370000
Oklahoma	186715	213000
Texas	2559021	2920000
Utah	632897	706000
Grand Total	**10017303**	**11273000**

Figure 2.37
This pivot table would be very difficult to create without PowerPivot.

This page intentionally left blank

INDEX

Symbols

32-bit PowerPivot version, 9–10

64-bit PowerPivot version, 9–10

& (ampersand) operator, 132–133

A

ABS function, 123, 129

active cell, hiding, 281

adding. *See* inserting

advantages
- of PowerPivot, 38–44, 58–60
- of PowerPivot Server, 286–287

ALLEXCEPT function, 237–239

ALL function, 230–240

ALLNONBLANKROW function, 238–239

ampersand (&) operator, 132–133

AND function, 140–141

appended data, handling improper data in, 73–74

asymmetric pivot tables, building with named sets, 39–40

asymmetric reporting, 33–34, 256–258

Atom feeds, importing data from, 83

autodetecting relationships, 85–88

AutoLayout mode (slicers), 41, 208

AVERAGE function, 226, 239

AVERAGEA function, 227, 239

AVERAGEIFS function, 228

AVERAGEX function, 144

axis line, deleting, 275–276

B

background color (of reports), changing, 280

back worksheets, moving pivot tables to, 211–212

banners, adding to reports, 282–284

bar charts, category charts as, 269

base fields, 188–189

base items, 188–189

Blank data type, 102–104

BLANK function, 140–141

blanks in Values area, 160–161

Boolean data type, 102

Boolean logic functions, 141

bottom row color, changing, 281

bounding rectangle for slicers, resizing, 206–207

building
- concatenated key relationships, 95–97
- pivot charts, 169–172
- pivot tables, 26–31, 152–162
  - Compact Layout, 162–166
  - data set for, 152–153
  - dragging from field list to drop zone, 158
  - from multiple tables, 38–39
  - mapping text and numeric fields, 155–157
  - with named sets, 39–40
  - Report Filter, 159–161
  - Report Filters versus slicers, 161–162
  - troubleshooting, 160–161

reports
arranging field headings, 150
with PowerPivot Field List, 150–152

C

calculated columns, 25–26, 110. *See also* DAX, functions

calculated fields, 43–44, 52, 218. *See also* DAX, measures

CALCULATE function, 239–241
Sales department example, 232–233
shortcut for, 234
SUMIFS function versus, 228–230
when not to use, 249–250

CALCULATETABLE function, 144

calculating
between pivot tables, 89–90
conditional calculations, 140–141
count distinct, 220–225
COUNTROWS function, 221
DISTINCT function, 220–221
DAX measures, 225
factorials, 129
logarithms, 129–130
magnitude of error, 129
period-to-date calculations, 245
quotients and remainders, 127–128
roots and powers, 127
sales
for full month/quarter/year, 246
for previous 30 days, 247
for previous month/quarter/year, 247

calculations, changing, 46–49, 184–189

calendar quarters, fiscal years and, 244–245

case
converting, 133
matching, 138–139
in relationships, 98

category charts, 269

CEILING function, 123–127

cell pointer, hiding, 281

cells
double-clicking, 52–53
editing, 49

changing
background color (of reports), 280
bottom row color, 281
calculations, 46–49, 184–189
column widths, 107–108
Compact Layout, 162–166
label scale, 271–272
numeric formatting, 190–192
part of pivot tables, 167–169
pasted data, 74–75
report titles, 269–270
Show Values drop-down, 187–188

character numbers, determining, 133–134

charts. *See* pivot charts

CLOSINGBALANCEMONTH function, 242, 249

CLOSINGBALANCEQUARTER function, 242, 249

closing balances, functions for, 249

CLOSINGBALANCEYEAR function, 242, 249

CODE function, 130, 133–134

color
background color (of reports), 280
bottom row color, 281
contrasting in reports, 280–281
defining in styles, 194–197
of slicers, 278

Column Labels fields, 149

columns
calculated columns, 110. *See also* DAX, functions
deleting, 109
freezing, 107
hiding, 108
increasing width of, 276
inserting with DAX formulas, 110–112
labels, 162–166
rearranging, 106–108
resizing, 107–108

columnwise data storage, 31–33

Compact Layout, changing, 162–166

comparisons, sales comparisons by date, 245–246

component charts as pie charts, 268

compressing data, 31–33, 39

concatenated key relationships, 95–97

CONCATENATE function, 131–133

conditional calculations, 140–141

conditions, testing, 141

context menu, 109

contrasting color and title in reports, 280–281

converting
- case, 133
- data to tables, 62–67
- pivot tables to cube formulas, 168–169, 263–266
- pivot tables to formulas, 43
- pivot tables to values, 168
- text to numbers, 139

copy/paste (importing data), 22–23, 67–76

COUNTA function, 226, 239

COUNTAX function, 144

COUNTBLANK function, 227, 239

count distinct, calculating, 220–225
- COUNTROWS function, 221
- DISTINCT function, 220–221

COUNT function, 227, 239

COUNTIFS function, 228

COUNTROWS function, 221, 239

counts, forcing, 184–185

COUNTX function, 144

Create Linked Table icon, 12

creating. *See* building

cube files, 172–173

cube formulas, converting pivot tables to, 168–169, 263–266

customers, sorting by sales, 175–179

custom lists, sorting pivot tables, 179–182

CY data type, 102

D

dashboard, formatting reports as, 280–281

Data Analysis Expression. *See* DAX (Data Analysis Expression)

data compression, 31–33, 39

data exports, 75–76

data imports, 18–23, 61–84
- from Atom feeds, 83
- converting to table and linking, 62–67
- copy/paste, 22–23, 67–76
- data sources supported, 83–84
- from external workbooks, 76–79
- sequence for, 19
- from SQL Server, 79–80
- text files, 19–22, 80–82

data labels, inserting, 274–275

data preparation, 17–18

data sets, 152–153

data sheet view, 101–109
- context menu, 109
- deleting columns, 109
- filtering data, 104–106
- hiding columns, 108
- numeric formatting, applying, 102–104
- printing, 106
- rearranging columns, 106–108
- sorting data, 104
- undo/redo, 109

data types (DAX), 102

data visualizations, 195–197

DATEADD function, 242

date and time functions (DAX), 112–119

Date data type, 102

DATE function, 112–114

DATEDIF function, 96

dates
- date functions (DAX), 248–249
- formatting, 132

DATESBETWEEN function, 242

DatesInPeriod function, 247

DATESINPERIOD function, 242

DATESMTD function, 241–242

DATESQTD function, 242

DATESYTD function, 243

DATEVALUE function, 112–114

DAX (Data Analysis Expression), 217
- calculated columns, inserting, 25–26
- data types, 102
- functions
  - ALL, 230–240
  - ALLEXCEPT, 237–238
  - CALCULATE, 228–233
  - COUNTROWS, 221
  - date and time functions, 112–119
  - date functions for monthly data, 248–249
  - DISTINCT, 220–221
  - FILTER, 234–237
  - FORMAT, 96
  - information functions, 142
  - logical functions, 139–142
  - math and trigonometry functions, 123–130
  - measure functions, 238–239
  - recursive functions, 145–146
  - RELATED, 90
  - summary functions, 226–228
  - text functions, 130–139
  - time intelligence functions, 242–250
  - values from related tables, 142–145
  - YEARFRAC, 96
- inserting columns, 110–112
- measures, 43–44, 110, 218
  - calculated fields versus, 218
  - calculating on demand, 225
  - changing, 184–189
  - creating, 222–224
  - filtering, 223–224
  - filters, 220, 226–234
  - function summary, 238–239
  - referencing other DAX measures, 225
  - shortcut for CALCULATE function, 234
- operators, 110–111

DAY function, 112, 116–117

December 30, 1899 result, troubleshooting, 120–121

decimals, removing, 124–127

defining
- named sets, 251–253
- relationships, 23–25, 88–89

deleting. *See also* uninstalling
- axis line, 275–276
- columns, 109
- gridlines, 273–274
- legends, 271
- on-chart controls, 272
- tick marks, 275
- values axis, 275

Design tab, 15, 192–194

Detection icon, 12

disabling. *See* uninstalling

disadvantages of PowerPivot, 44–60

DISTINCT function, 220–221, 239

double-clicking cells, 52–53

drop zones
- dragging from field list to, 158
- as filters, 219

E

EARLIER function, 145–146

EARLIEST function, 146

EDATE function, 112, 119–120

editing
- cells, 49
- GetPivotData formula, 49–51
- slicers, 276–278

ENDOFMONTH function, 243

ENDOFQUARTER function, 243

ENDOFYEAR function, 243

EOMONTH function, 113, 119–120

errors, testing for, 141–142

EXACT function, 131, 138–139

Excel 2010
- benefits of, 2–5
- copy/paste data sets into, 106
- PowerPivot system requirements, 9–11
- Starter Edition, 11

Excel Ribbon, minimizing, 281

Excel Web App, 11

EXP function, 123, 129–130

exporting data for editing, 75–76

external workbooks, importing data from, 76–79

F

FACT function, 123, 129

factorials, calculating, 129

FALSE function, 140–141

feeds. *See* Atom feeds

field headings, arranging, 150

field lists
- dragging to drop zone, 158
- undocking, 28

File tab, 13

FILTER function, 234–239

filtering
- DAX measures, 223–224
- in data sheet view, 104–106
- multiple values from related tables, 144
- pivot tables, 182–184
- with Report Filter, 159–162

filters
- DAX measures and, 220, 226–228
- drop zones as, 219
- ignoring, 228–234

FIND function, 131, 135–137

FIRSTDATE function, 243, 248

FIRSTNONBLANK function, 238–239, 243

fiscal years, 244–245

FIXED function, 131, 139

flattened pivot tables, 165–166

FLOOR function, 123–127

forcing counts, 184–185

FORMAT function, 96, 131–132

formatting. *See also* layouts
- numbers/dates, 102–104, 132, 139
- pivot tables, 190–197
  - changing numeric formatting, 190–192
  - colors, 194–197
  - Design tab, 192–194
- reports, 267–284
  - axis line, deleting, 275–276
  - background color, changing, 280
  - bottom row color, changing, 281
  - category charts as bar charts, 269
  - cell pointer, hiding, 281
  - columns, increasing width of, 276
  - component charts as pie charts, 268
  - contrast color and title, 280–281
  - data labels, inserting, 274–275
  - formula bar, hiding, 281
  - gridlines, deleting, 273–274
  - gridlines, hiding, 279
  - interface elements, hiding, 279–280
  - label scale, changing, 271–272
  - legends, deleting, 271
  - on-chart controls, deleting, 272
  - pictures as top banners, 282–284
  - pie charts, replacing legends with labels, 273
  - PowerPivot Field List, hiding, 280
  - preserving with GetPivotData formula, 258–263
  - ribbon, minimizing, 281
  - slicers, editing, 276–278
  - tick marks, deleting, 275
  - time series charts as line/column charts, 268
  - titles, changing, 269–270
  - values axis, deleting, 275
  - zoom slider adjustments, 281

formula bar, hiding, 281

formulas
- calculating between pivot tables, 89–90
- converting pivot tables to, 43
- GetPivotData, 49–51, 258–263
- inserting columns, 110–112
- in tables, 65

freezing columns, 107

full month/quarter/year, calculating sales for, 246

functions (DAX)
- ALL, 230–240
- ALLEXCEPT, 237–238
- CALCULATE
  - Sales department example, 232–233
  - shortcut for, 234

SUMIFS function versus, 228–230
COUNTROWS, 221
date and time functions, 112–119, 248–249
DISTINCT, 220–221
FILTER, 234–237
FORMAT, 96
information functions, 142
logical functions, 139–142
math and trigonometry functions, 123–130
measure functions, 238–239
recursive functions, 145–146
RELATED, 90
summary functions, 226–228
text functions, 130–139
time intelligence functions, 242–250
values from related tables, 142–145
YEARFRAC, 96

G

generating random numbers, 127

GetPivotData formula, 49–51, 258–263

grand total row, correcting in named sets, 254–256

graphics as report banners, 282–284

gridlines
deleting, 273–274
hiding, 279

grouping in pivot tables, 53–55

H

handling improper data
in appended data, 73–74
in copy/paste data, 71–73

hiding
cell pointer, 281
columns, 108
formula bar, 281
gridlines, 279
interface elements, 279–280
PowerPivot Field List, 280

Home tab, 14

horizontal slicers, 203

HOUR function, 113, 116–117

I

I8 data type, 102

IFERROR function, 140–142

IF function, 140–141

ignoring filters, 228–234

images as report banners, 282–284

importing data, 18–23, 61–84
from Atom feeds, 83
converting to table and linking, 62–67
copy/paste, 22–23, 67–76
data sources supported, 83–84
from external workbooks, 76–79
sequence for, 19
from SQL Server, 79–80
text files, 19–22, 80–82

improper data, handling
in appended data, 73–74
in copy/paste data, 71–73

In Figure 10.18, 232

information functions (DAX), 142

inserting
calculated columns, 25–26
columns, 110–112
data labels, 274–275
records, 69–70
slicers, 203–208
top banners on reports, 282–284

installing PowerPivot, 11–15

interface elements, hiding, 279–280

INT function, 124–127

ISBLANK function, 142

ISERROR function, 142

ISLOGICAL function, 142

ISNONTEXT function, 142

ISNUMBER function, 142

ISTEXT function, 142

IT department, usage of PowerPivot Server, 291–292

J-K-L

joining
pivot tables, 40. *See also* relationships
text, 132–133

labels
data labels, inserting, 274–275
replacing legends with, 273

label scale, changing, 271–272

LASTDATE function, 243, 248

LASTNONBLANK function, 243

layouts
adding pivot charts to, 208–212
adding pivot tables to, 212–215
in PowerPivot, 199
slicers and, 199–200
two pivot charts, 200–203

LEFT function, 131, 134–135

legends
deleting, 271
replacing with labels, 273

LEN function, 131, 135

line/column charts, 268

Linked Table tab, 15

linking Excel tables to PowerPivot, 62–67

LN function, 124, 129–130

LOG10 function, 124, 129–130

logarithms, calculating, 129–130

LOG function, 124, 129–130

logical functions (DAX), 139–142

lookup tables, unwinding, 91–95

LOWER function, 131, 133

M

macros. *See* VBA

magnitude of error, calculating, 129

manually defining relationships, 88–89

many-to-many relationships, 98

mapping text and numeric fields, 155–157

matching case, 138–139

math and trigonometry functions (DAX), 123–130

MAX function, 226, 239

MAXA function, 227, 239

MAXX function, 145

MDX (Multidimensional Extensions), 217

measures (DAX), 43–44, 110, 218
calculated fields versus, 218
calculating on demand, 225
changing, 184–189
creating, 222–224
filtering, 223–224
filters, 220, 226–234
function summary, 238–239
referencing other DAX measures, 225
shortcut for CALCULATE function, 234

Microsoft SQL Server PowerPivot for Excel. See PowerPivot

MID function, 131, 134–135

MIN function, 226, 239

MINA function, 227, 239

minimizing Excel Ribbon, 281

MINUTE function, 113, 116–117

MINX function, 145

MOD function, 124, 127–128

MONTH function, 113, 116–117

monthly data, date functions (DAX) for, 248–249

month names, sorting, 44–46, 177–179

moving
part of pivot tables, 167–169
pivot tables to back worksheets, 211–212

MROUND function, 124–127

Multidimensional Extensions (MDX), 217

multiple conditions, testing, 141

multiple consolidation range pivot tables, 92

multiple pivot tables, joining, 40. *See also* relationships

multiple relationships, 98

multiple tables, building pivot tables from, 38–39

multiple values from related tables, 143

N

named ranges, 77

named sets
for asymmetric reports, 256–258
building asymmetric pivot tables, 39–40
defining, 251–253
grand total row, correcting, 254–256

NAND function, 141

natural logarithms, 130, 147

navigating worksheets, 280

negative numbers, 126

New Measures icon, 12

NEXTDAY function, 243

NEXTMONTH function, 243

NEXTQUARTER function, 243

NEXTYEAR function, 243

NOR function, 141

NOT function, 140–141

NOW function, 113–116

numbers
converting text to, 139
numeric formatting, 132, 139
applying, 102–104
changing, 190–192
in relationships, 99

numeric fields, mapping to values, 155–157

O

on-chart controls, deleting, 272

OPENINGBALANCEMONTH function, 243, 249

OPENINGBALANCEQUARTER function, 243, 249

OPENINGBALANCEYEAR function, 243, 249

opening balances, functions for, 249

operators (DAX), 110–111, 132–133

OR function, 140–141

P

PARALLELPERIOD function, 244, 248

pasted data, changing, 74–75

period-to-date calculations, 245

pictures as report banners, 282–284

pie charts
component charts as, 268
replacing legends with labels, 273

PI function, 124, 128

pivot charts. *See also* reports
adding to layouts, 208–212
building, 169–172
category charts, 269
component charts as pie charts, 268
line/column charts, 268
on-chart controls, deleting, 272
pie charts, replacing legends with labels, 273
standalone pivot charts, 42–43, 211–212
two pivot charts layout, 200–203
width of columns, increasing, 276

pivot tables. *See also* PowerPivot
adding to layouts, 212–215
building, 26–31, 152–162
Compact Layout, 162–166
data set for, 152–153
dragging from field list to drop zone, 158
from multiple tables, 38–39
mapping text and numeric fields, 155–157
with named sets, 39–40
Report Filter, 159–161
Report Filters versus slicers, 161–162
troubleshooting, 160–161
calculated columns, 25–26
calculated fields, 52
calculating between, 89–90
calculations, changing, 46–49, 184–189
cells
double-clicking, 52–53
editing, 49
changing part of, 167–169
converting to cube formulas, 168–169, 263–266
converting to formulas, 43

converting to values, 168
elements of, 149–150
exporting data for editing, 75–76
filters
drop zones as, 219
Top 10 filter, 182–184
flattened pivot tables, 165–166
formatting, 190–197
changing numeric formatting, 190–192
colors, 194–197
Design tab, 192–194
grouping in, 53–55
hooking to slicers, 210–211
joining, 40. *See also* relationships
months, sorting, 44–46
moving to back worksheets, 211–212
records, inserting, 69–70
refreshing, 166–167
relationships
autodetecting, 85–88
concatenated key relationships, 95–97
defining, 23–25
defining manually, 88–89
troubleshooting, 98–99
unwinding lookup tables, 91–95
VLOOKUP function versus, 98
Show Items with No Data option, 51–52
Show Pages feature, 57–58
sorting, 175–182
by custom lists, 179–182
by month names, 177–179
customers by sales, 175–179
typing adjustments on-worksheet, 55–57
VBA and, 49

POWER function, 124, 127

PowerPivot. *See also* pivot tables
advantages of, 38–44, 58–60
asymmetric reporting, 33–34
benefits of, 2–5
data compression, 31–33, 39
data preparation for, 17–18
disadvantages of, 44–60
importing data into, 18–23, 61–84
installing, 11–15
layouts in, 199
ribbon tabs in, 12–15
system requirements, 9–11
uninstalling, 16

PowerPivot Field List
building reports, 150–152
cube files, 172–173
hiding, 280

PowerPivot Server
advantages of, 286–287
IT department usage, 291–292
reports
troubleshooting, 292–294
uploading, 287–288
viewing, 288–291
requirements, 285–286

PowerPivot tab, icons in, 11–12

PowerPivot window
data sheet view, 101–109
context menu, 109
deleting columns, 109
filtering data, 104–106
hiding columns, 108
numeric formatting, applying, 102–104
printing, 106
rearranging columns, 106–108
sorting data, 104
undo/redo, 109
DAX formulas in, 111–112

PowerPivot Window icon, 12

powers, calculating, 127

preparing data, 17–18

preserving report formatting with GetPivotData formula, 258–263

previous 30 days, calculating sales for, 247

PREVIOUSDAY function, 244

PREVIOUSMONTH function, 244

previous month/quarter/year, calculating sales for, 247

PREVIOUSQUARTER function, 244

PREVIOUSYEAR function, 244

printing data sheet view, 106

Q

Quick Access toolbar, 15

QUOTIENT function, 124, 127–128

quotients, calculating, 127–128

R

R8 data type, 102

RANDBETWEEN function, 124, 127

RAND function, 124, 127

random numbers, generating, 127

ranges, named ranges, 77

rearranging columns, 106–108

recalculating. *See* refreshing

records, inserting, 69–70

recursive functions (DAX), 145–146

referencing DAX measures, 225

refreshing
- imported data, 78–79
- pivot tables, 166–167

RELATED function, 90, 143–145

RELATEDTABLE function, 143–145

related tables, values from, 142–145

relationships
- autodetecting, 85–88
- calculating between pivot tables, 89–90
- concatenated key relationships, 95–97
- defining, 23–25
- defining manually, 88–89
- troubleshooting, 98–99
- unwinding lookup tables, 91–95
- VLOOKUP function versus, 98

remainders, calculating, 127–128

removing. *See* uninstalling
- decimals, 124–127
- trailing spaces, 133

renaming tables, 98

repeating text, 138

REPLACE function, 131, 137–138

replacing legends with labels, 273

Report Filter, 150, 159–162

Report gallery, 288–291

reports. *See also* layouts; pivot charts
- asymmetric reporting, 33–34, 256–258
- building
  - arranging field headings, 150
  - with PowerPivot Field List, 150–152
- formatting, 267–284
  - axis line, deleting, 275–276
  - background color, changing, 280
  - bottom row color, changing, 281
  - category charts as bar charts, 269
  - cell pointer, hiding, 281
  - columns, increasing width of, 276
  - component charts as pie charts, 268
  - contrast color and title, 280–281
  - data labels, inserting, 274–275
  - formula bar, hiding, 281
  - gridlines, deleting, 273–274
  - gridlines, hiding, 279
  - interface elements, hiding, 279–280
  - label scale, changing, 271–272
  - legends, deleting, 271
  - on-chart controls, deleting, 272
  - pictures as top banners, 282–284
  - pie charts, replacing legends with labels, 273
  - PowerPivot Field List, hiding, 280
  - preserving with GetPivotData formula, 258–263
  - ribbon, minimizing, 281
  - slicers, editing, 276–278
  - tick marks, deleting, 275
  - time series charts as line/column charts, 268
  - titles, changing, 269–270
  - values axis, deleting, 275
  - zoom slider adjustments, 281
- in PowerPivot Server, troubleshooting, 292–294
- layouts, 200–203
- uploading to PowerPivot Server, 287–288
- viewing in PowerPivot Server, 288–291

REPT function, 131, 138

requirements. *See* system requirements

resizing
bounding rectangle for slicers, 206–207
columns, 107–108
slicers, 204–206

ribbon
minimizing, 281
ribbon tabs in PowerPivot, 12–15

RIGHT function, 131, 134–135

roots, calculating, 127

ROUNDDOWN function, 124–127

ROUND function, 124–127

rounding numbers, 124–127

ROUNDUP function, 124–127

Row Labels fields, 149, 155–157

S

sales
calculating
for full month/quarter/year, 246
for previous 30 days, 247
for previous month/quarter/year, 247
sales comparisons by date, 245–246
sorting customers by, 175–179

SAMEPERIODLASTYEAR function, 244

scale (in labels), changing, 271–272

SEARCH function, 131, 135–137

SECOND function, 113, 116–117

server version of PowerPivot. ***See*** **PowerPivot Server**

Show Items with No Data option, 51–52

Show Pages feature, 57–58

Show Values drop-down, changing, 187–188

SIGN function, 124–127

significance, negative numbers for, 126

slicers
AutoLayout mode, 208
bounding rectangle, resizing, 206–207
editing, 276–278
inserting, 203–208
joining multiple pivot tables, 40
layouts and, 199–200
PowerPivot AutoLayout, 41
Report Filter versus, 161–162
resizing, 204–206

sorting
in data sheet view, 104
months, 44–46
pivot tables, 175–182
by custom lists, 179–182
by month names, 177–179
customers by sales, 175–179

sparklines, 195–197

splitting text, 134–135

SQL Server, importing data from, 79–80

SQRT function, 124, 127

standalone pivot charts, 42–43, 211–212

STARTOFMONTH function, 244

STARTOFQUARTER function, 244

STARTOFYEAR function, 244

String data type, 102

styles, defining colors in, 194–197

SUBSTITUTE function, 131, 137–138

SUM function, 146–147, 226, 239

SUMIFS function, 228–230

summary functions (DAX), 226–228

SUMX function, 145

system requirements, 9–11, 285–286

T

tables
converting data to, 62–67
formulas in, 65
renaming, 98

testing
conditions, 141
for errors, 141–142
multiple conditions, 141

text
converting to numbers, 139
formatting numbers as, 139
joining, 132–133
numbers as, 99
repeating, 138
splitting, 134–135

text fields, mapping to row labels, 155–157

text files, importing, 19–22, 80–82

TEXT function, 96, 132

text functions (DAX), 130–139

tick marks, deleting, 275

time and date functions (DAX), 112–119

TIME function, 113, 121–122

time intelligence functions (DAX), 242–250

time series charts, 268

TIMEVALUE function, 113, 123

titles (of reports), changing, 269–270

TODAY function, 113–116

Toggle Field List icon, 12

Top 10 filter, 182–184

top banners, adding to reports, 282–284

TotalMTD function, 244

TotalQTD function, 244

TotalYTD function, 244

trailing spaces
in relationships, 99
removing, 133

trigonometry functions (DAX), 123–130

TRIM function, 131–133

troubleshooting
blanks in Values area, 160–161
column labels, 162–166
date and time functions, 120–121
PowerPivot Server reports, 292–294
relationships, 98–99

TRUE function, 140–141

TRUNC function, 124–127

two pivot charts layout, 200–203

typing adjustments on-worksheet, 55–57

U

undocking field list, 28

Undo feature, 44

undo/redo in data sheet view, 109

uninstalling PowerPivot, 16

unwinding lookup tables, 91–95

updating. ***See also*** **refreshing**
imported data, 78–79
linked table data, 65–67

uploading reports to PowerPivot Server, 287–288

UPPER function, 131–133

V

VALUE function, 131, 139

values
converting pivot tables to, 168
mapping numeric fields to, 155–157

Values area, 149, 160–161

values axis, deleting, 275

VALUES function, 239

VBA, pivot tables and, 49

vertical slicers, 203

viewing reports in PowerPivot Server, 288–291

VLOOKUP function, 98

W

WEEKDAY function, 113, 117–118

WEEKNUM function, 113, 118

width of columns
changing, 107–108
increasing, 276

worksheets, navigating, 280

wrapper functions, COUNTROWS as, 221

X-Y-Z

XOR function, 141

YEARFRAC function, 96, 113, 119–120

YEAR function, 113, 116–117

zoom slider adjustments, 281