

Office 2016– Excel Basics 21

Video/Class Project #33

Excel Basics 21: Relationships Rather than VLOOKUP for PivotTable Reports (Excel 2016 Data Model)

Goal in video # 21: Learn about how to use the Relationships to replace VLOOKUP for PivotTable Reports.

Topics Covered in Video:

- 1) Goal: Rather than use VLOOKUP to add Helper Columns to our Sales Table, we are going to use the Relationships feature for our PivotTable Report.
 - i. In Last Video we had to use VLOOKUP to create a Helper Column with the Country Name, like this:

County Code	Units	Rev	COGS	Country	Prod
MEX	36	161	115	=VLOOKUP(C9,\$K\$9:\$L\$134,2,0)	
DZA	1	24	9.15	Algeria	Inter
FRA	3	65.9	27	France	Begin
USA	4	104	41.2	United States	Inter
CAN	2	52	21.6	Canada	Inter
USA	4	1008	377	United States	Adva

- ii. Then we create a PivotTable like this:

Country	ProductCategory	Average of Rev (\$)
Algeria	Advanced	\$770.18
	Beginner	\$80.68
	Competition	\$293.16
	Freestyle	\$238.16
	Intermediate	\$91.41
	Novelty	\$69.76
Algeria Total		\$122.00
Argentina	Advanced	\$418.88
	Beginner	\$78.51
	Competition	\$173.72
	Freestyle	\$186.65
	Intermediate	\$111.57
	Novelty	\$51.71
Argentina Total		\$109.67

- iii. The problem with the method that we used is that we had 73,000 rows with a VLOOKUP formula in each one. This can cause the workbook to run slowly and it can increase the file size.
- 2) In this video we want to see how to use the Relationships feature as a substitute for VLOOKUP.
- 3) The benefits of the Relationships Method rather than VLOOKUP are:
 - i. There will not be a lot of formulas that have to calculate in the Excel Workbook and this can help a workbook with many formulas to not have a slow reaction time when a new formula is created.
 - ii. The File size can be significantly smaller if we use Relationships rather than VLOOKUP.

Here are the Steps for the Project in this video:

- 1) **Step 1:** Convert each Table to an Excel Table and name the tables smartly. We have three tables that we have to name on the sheet names "SalesData".
 - i. To name each table, click in one cell and use Ctrl + T to convert it to an Excel Table.
 - ii. Here is a picture of the three tables and the names for each:

The screenshot shows an Excel spreadsheet with three tables. The first table, labeled 'SalesTable', is located in columns A through F and contains sales data including Date, Product, Country Code, Units, Revenue, and COGS. The second table, labeled 'CountyLookupTable', is located in columns G through J and contains Country Code and Country names. The third table, labeled 'ProductLookupTable', is located in columns M through P and contains Product names, Retail Price, Standard Cost, and Product Category. Red arrows point from the table names to their respective data ranges.

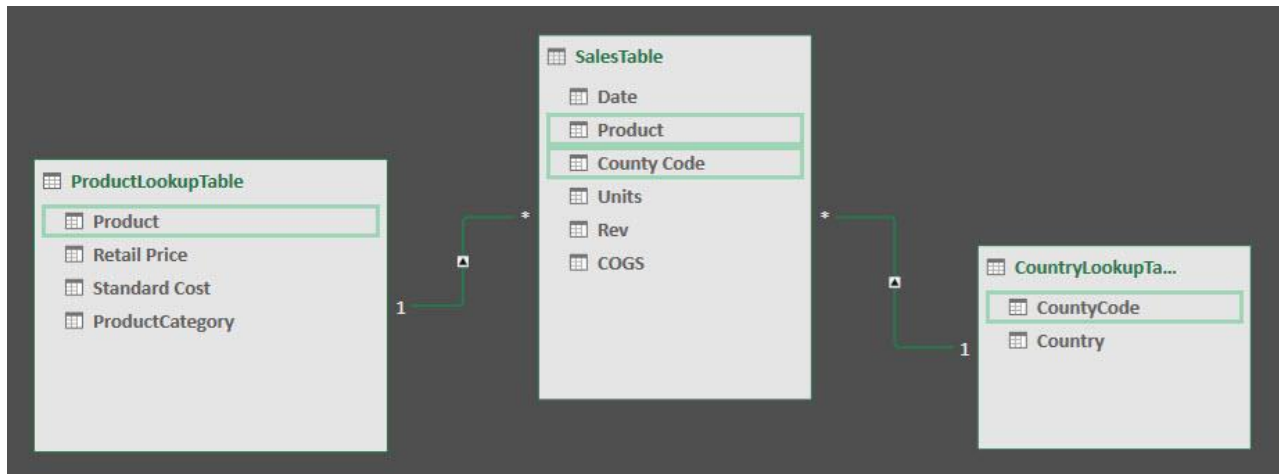
- 2) Notice that the Sales Table has a Product Field with many duplicate values and it has a Country Code Field with many duplicates:

Date	Product	Country Code	Units	Rev	COGS
12/16/2017	Fun Fly	MEX	36	\$161.05	\$114.66
8/12/2017	Eagle	DZA	1	\$23.95	\$9.15
12/28/2018	Carlota	FRA	3	\$65.85	\$26.97
12/28/2018	Phoenix	USA	4	\$103.80	\$41.23
4/2/2017	Yanaki	CAN	2	\$51.98	\$21.64
10/3/2018	Manu LD	USA	4	\$1,008.00	\$376.94
11/17/2017	Aspen	JPN	2	\$47.90	\$20.67
9/28/2017	Majestic Beut	AUS	3	\$86.85	\$32.40
12/16/2017	Darnell Tri Fly	PER	1	\$11.95	\$4.46
10/4/2017	Gelfast	ECU	2	\$52.00	\$24.29
9/21/2017	Carlota	LKA	2	\$43.90	\$14.59
12/14/2018	Manu LD	ARM	1	\$252.00	\$105.26
7/2/2016	Gelfast	KHM	4	\$104.00	\$44.16
10/7/2018	Fun Fly	NLD	2	\$13.98	\$6.70
10/30/2018	Sunshine	NLD	1	\$21.95	\$9.34
8/25/2017	Phoenix	VNM	1	\$25.95	\$9.77
7/28/2018	Fun Fly	NOR	5	\$34.60	\$15.76
1/8/2018	Fun Fly	USA	1	\$6.99	\$3.54
6/21/2016	Fun Fly	HKG	1	\$6.99	\$3.54

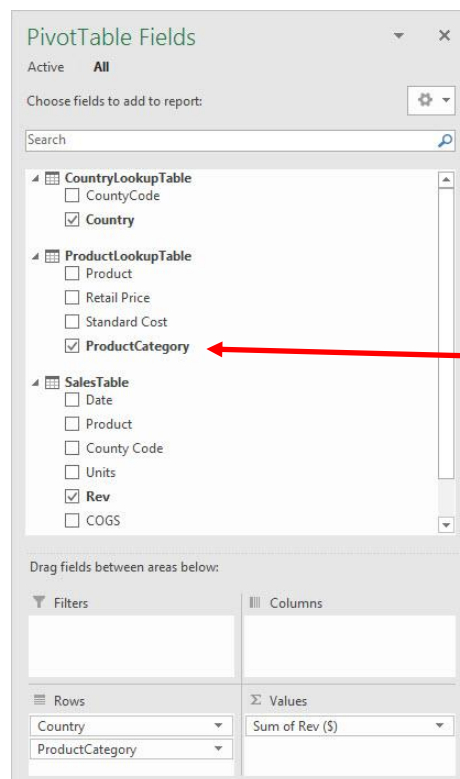
- 3) Notice that for both of our Lookup Tables, the first column has a unique list of values:

CountyCode	Country	Product	Retail Price	Standard Cost	ProductCategory
AFG	Afghanistan	Alpine	23.95	10.09	Beginner
ALB	Albania	Aspen	23.95	9.48	Beginner
APR	Aprine	Bellen	26.99	10.75	Beginner
ARE	United Arab Emirates	Bower Aussie Round	45	18.45	Competition
ARG	Argentina	Carlota	21.95	8.48	Beginner
ARM	Armenia	Carlota Doublers	71	30.25	Freestyle
AUS	Australia	Crested Beut	19.95	8.5	Intermediate
AUT	Austria	Darnell Tri Fly	11.95	5.25	Beginner
AZE	Azerbaijan	Eagle	23.95	8.97	Intermediate
BEL	Belgium	Fire Aspen	23.5	9.55	Advanced
BGD	Bangladesh	Frido Fast Catch	41.95	21.45	Competition
BGR	Bulgaria	Fun Fly	6.99	3.25	Beginner
BHR	Bahrain	Gelfast	26	11.04	Competition
BHS	Bahamas	Majestic Beut	28.95	11.49	Intermediate
BIH	Bosnia and Herzegovina	Manu LD	252	100.25	Advanced
BLZ	Belize	Manu MTA	122	49.78	Competition
BOL	Bolivia	Phoenix	25.95	10.85	Intermediate
BRA	Brazil	Quad	41.95	16	Freestyle
BRB	Barbados	Sunset	25.5	10.51	Competition
BRN	Brunei Darussalam	Sunshine	21.95	8.65	Beginner
BWA	Botswana	Sunspot	14.5	6	Novelty
CAN	Canada	Yanaki	25.99	10.02	Intermediate
CHE	Switzerland				

- 4) When we use VLOOKUP to lookup a value from the Sales Table we are allowed to have many duplicate Product Names or Country Code names, but in the first column of the lookup tables we can never have duplicate values because if we did, VLOOKUP would not know how to do a lookup – the duplicate values would cause an ambiguous situation.
- The first column in a lookup table must always have a unique list of values.
 - This is important because if we do have a unique list of values in the first column of the lookup table and we are doing Exact Match Lookup, rather than use VLOOKUP, we can simply connect the first column of the lookup table to the Sales Table using a Relationship. In a picture, it would look like this:



- 5) In the picture, the Number “1” means that the first column of the lookup table is only allowed to have “One of Each Value” in the first column. The asterisk on the other side of the Relationship line means that this side can have many duplicates. This is called a “One-To-Many” Relationship. And it makes sense, because in the Lookup Table you can list the Product only one time, but on the “Many” side of the relationship you are allowed to sell that one product many times!!!
- 6) Once we create these One-To-Many Relationships between the Lookup Tables and the Sales Table, we can then have multiple tables in our PivotTable Field List and drag and drop field from which ever table we would like, like in this picture:



With Relationships we are allowed to have many Tables in the PivotTable Fields Task Pane.

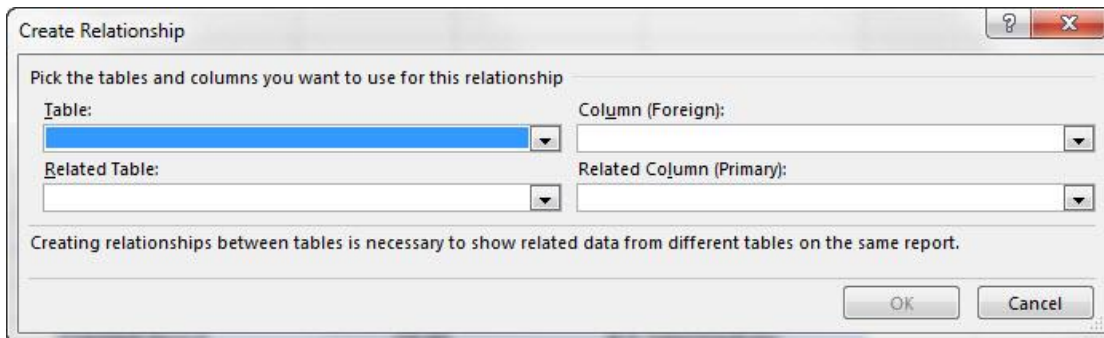
7) **Step 2:** Create the Relationships between the tables.

- i. Go to the Data Ribbon Tab, then in the Data Tools group click the Relationships button. The Manage Relationships dialog box looks like this:



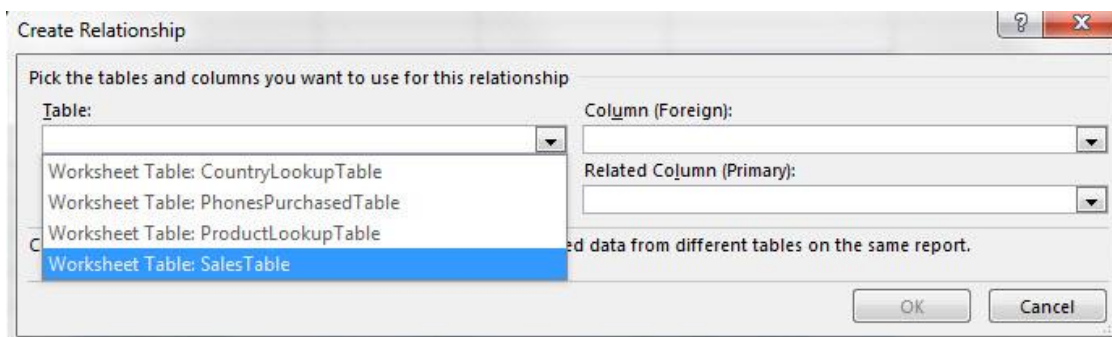
8) Click the New Button and you will see the Create Relationship dialog box.

- i. The Table field is where you put the Sales Table
- ii. The “Related Table” is always the Lookup Table.



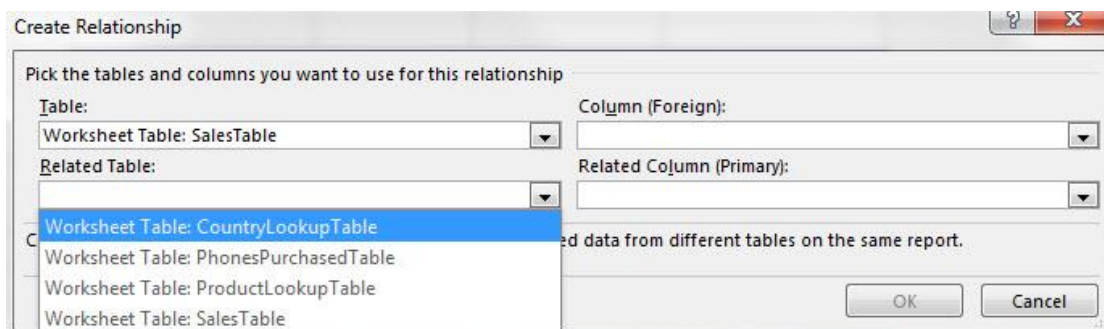
9) Click the dropdown in the Table textbox and select “Worksheet Table: SalesTable”

- i. Notice that there are four Worksheet Tables. (There is a fourth table in our workbook that we are not using for our PivotTable, but it still shows up in this list.)
- ii. “Worksheet Table” is a synonym for “Excel Table”.

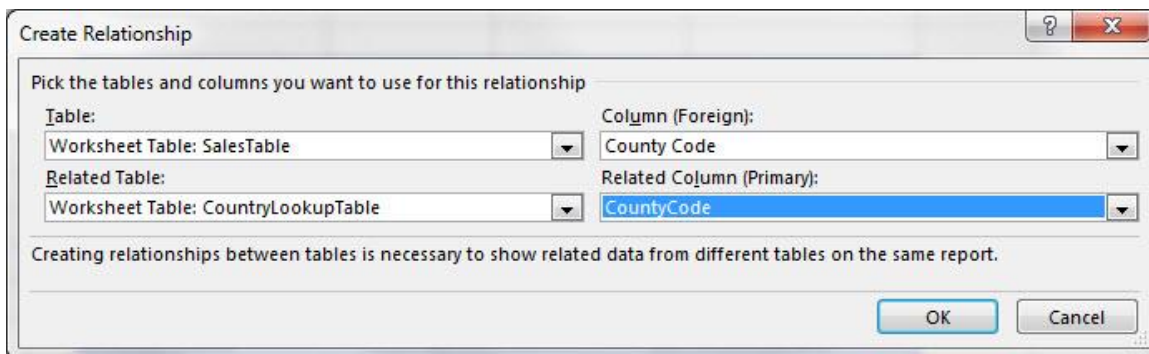


10) From the Related Table textbook, select the first Lookup Table, “Worksheet Table CountryLookupTable”

- i. The Related Table is always the Lookup Table.
- ii. “Primary” refers to the fact that the first column in the lookup table has a unique list of “primary” elements. The phrase “Primary Key” is used in Access and in Database terminology to mean the first column of the lookup table that contains a unique list.



- 11) Now that we can select the Country Code Field from the SalesTable in the “Column (Foreign):” textbox and we can select the Country Code Field from the CountryLookupTable in the “Related Column (Primary):” textbox
- i. When we click OK, a One-To-Many Relationship will be created between the Country Code Field in the CountryLookupTable and the Country Code Field in the SalesTable.



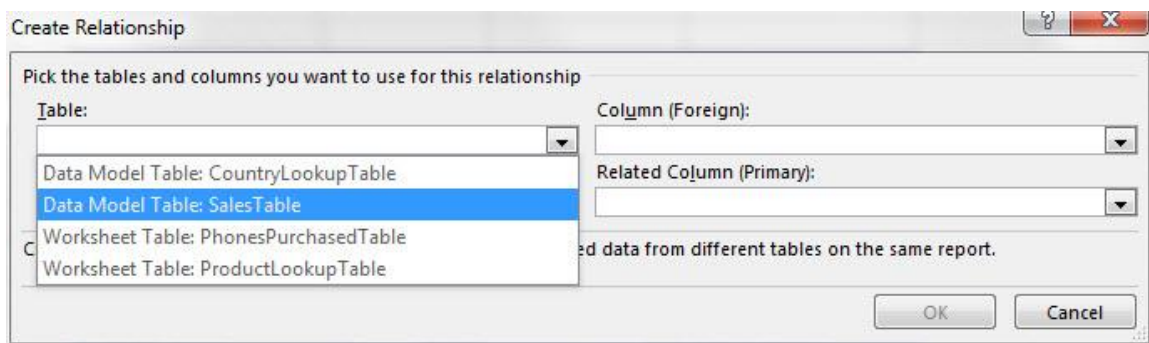
- 12) After creating the Relationship, the Manage Relationships dialog Box lists our first Relationship.



Important Note:

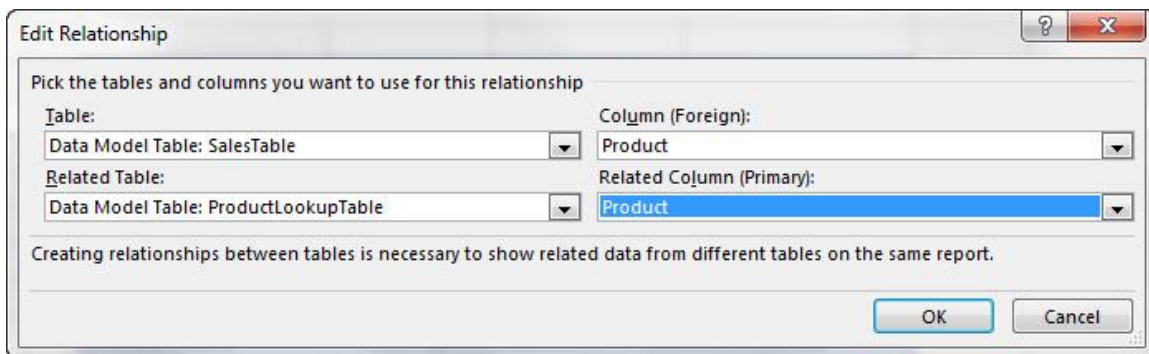
We you create a Relationship between two tables, the tables and the Relationship are stored in a behind the scenes database called the “Data Model”. This Data Model is an efficient and compact way of storing tables and relationships. In fact, if you compare the same PivotTable Report using VLOOKUP and the Data Model and Relationships, you will see that the file size is much smaller for the Data Model and Relationships PivotTable Report. You can check the size of the file named “EB21-PivotTablesVLOOKUPFinished.xlsxm” and compare it to the size of the file named “EB21-PivotTablesRelationshipsFinished.xlsxm” using Windows Explorer. If you have a lot of data using Relationships rather than VLOOKUP can significantly reduce file size and formula calculation time.

- 13) Now, we want to create our second Relationship between the SalesTable and the ProductLookupTable.
- 14) Click the New button in the Manage Relationships dialog box and then select the SalesTable in the dropdown for the Table textbox, like in this picture:



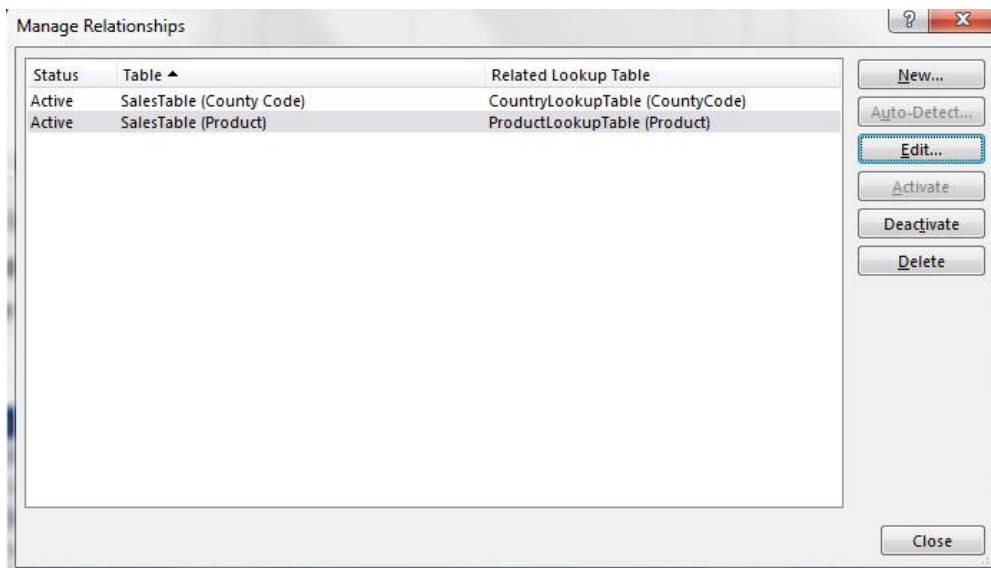
- 15) When we create the second relationship, notice that the Table textbox now lists the “SalesTable” as a “Data Model Table”.

16) Complete the textboxes in the Create Relationships dialog box as seen here:



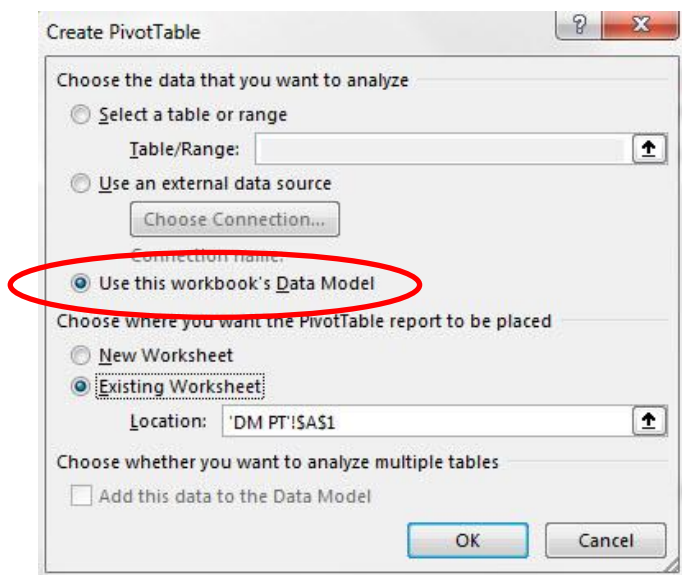
The 'Edit Relationship' dialog box is shown. It has a title bar with a question mark and a close button. The main area is titled 'Pick the tables and columns you want to use for this relationship'. It contains four dropdown menus: 'Table' (set to 'Data Model Table: SalesTable'), 'Column (Foreign)' (set to 'Product'), 'Related Table' (set to 'Data Model Table: ProductLookupTable'), and 'Related Column (Primary)' (set to 'Product'). Below these is a note: 'Creating relationships between tables is necessary to show related data from different tables on the same report.' At the bottom are 'OK' and 'Cancel' buttons.

17) When you click OK the Manage Relationships dialog box will list two One-To-Many Relationships.
i. Note: Relationships can be used when you are doing Exact Match Lookup.



The 'Manage Relationships' dialog box is shown. It has a title bar with a question mark and a close button. The main area is a table with three columns: 'Status', 'Table', and 'Related Lookup Table'. It lists two relationships: 'SalesTable (County Code)' related to 'CountryLookupTable (CountyCode)' and 'SalesTable (Product)' related to 'ProductLookupTable (Product)'. To the right of the table are buttons: 'New...', 'Auto-Detect...', 'Edit...' (highlighted with a red dashed border), 'Activate', 'Deactivate', and 'Delete'. At the bottom is a 'Close' button.

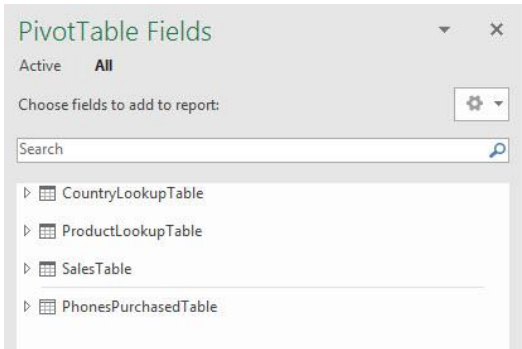
18) **Step 3:** Insert a new sheet and name it "DM PT". Then create a PivotTable and in the Create PivotTable dialog Box, check the dialog button "Use this workbook's Data Model", as seen here:



The 'Create PivotTable' dialog box is shown. It has a title bar with a question mark and a close button. The main area is titled 'Choose the data that you want to analyze'. It has three radio buttons: 'Select a table or range', 'Use an external data source', and 'Use this workbook's Data Model' (which is selected and circled in red). Below the radio buttons are text boxes for 'Table/Range:', 'Choose Connection...', and 'Connection name:'. Below these is another section titled 'Choose where you want the PivotTable report to be placed' with two radio buttons: 'New Worksheet' and 'Existing Worksheet' (which is selected). Below this is a text box for 'Location:' set to 'DM PT!\$A\$1'. At the bottom is a checkbox 'Add this data to the Data Model' which is unchecked. At the bottom are 'OK' and 'Cancel' buttons.

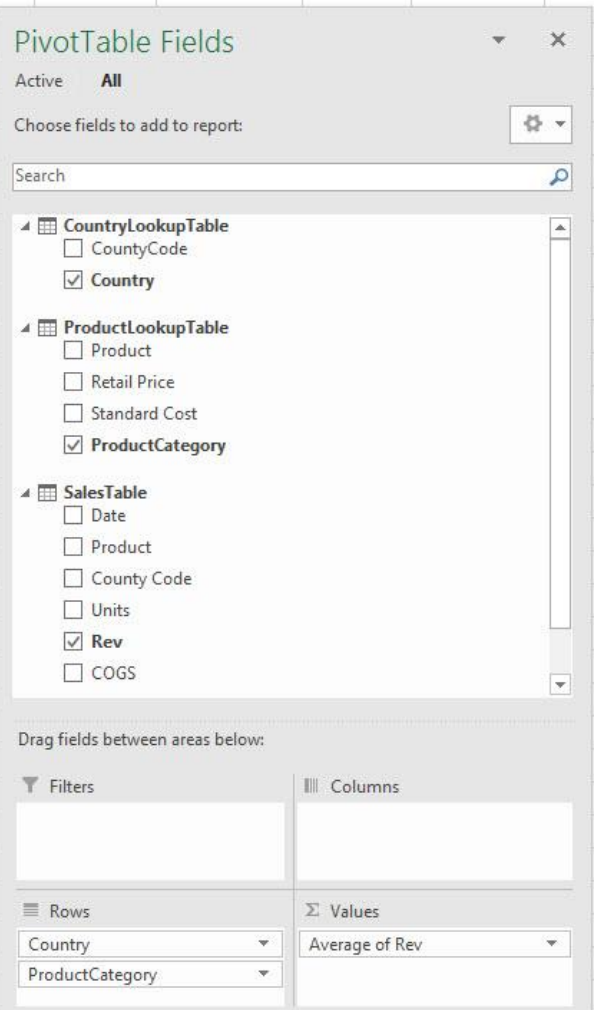
19) After you click OK in the Create PivotTable dialog box, you will see that there are three Data Model Tables in the PivotTable Fields Task Pane.

i. "Data Model" Tables have a black Bar at the top to indicate that they are from the Data Model.



20) **Step 4:** Expand the tables and drag the Country field from the CountryLookupTable to Rows area, ProductCategory field from the ProductLookupTable to Columns area and Rev Field from SalesTable to Values area, as seen below. Then complete the PivotTable as seen here:

	A	B	C	D	E	F	G	H
1	Country	ProductCategory	Average of Rev					
2	Algeria	Advanced	\$770.18					
3		Beginner	\$80.68					
4		Competition	\$293.16					
5		Freestyle	\$238.16					
6		Intermediate	\$91.41					
7		Novelty	\$69.76					
8	Algeria Total		\$122.00					
9	Argentina	Advanced	\$418.88					
10		Beginner	\$78.51					
11		Competition	\$173.72					
12		Freestyle	\$186.65					
13		Intermediate	\$111.57					
14		Novelty	\$51.71					
15	Argentina Total		\$109.67					
16	Armenia	Advanced	\$185.33					
17		Beginner	\$78.56					
18		Competition	\$182.53					
19		Freestyle	\$188.97					
20		Intermediate	\$92.59					
21		Novelty	\$18.64					
22	Armenia Total		\$96.44					
23	Australia	Advanced	\$515.48					
24		Beginner	\$76.11					
25		Competition	\$219.63					
26		Freestyle	\$188.36					
27		Intermediate	\$113.81					
28		Novelty	\$58.99					
29	Australia Total		\$114.69					
30	Austria	Advanced	\$920.28					
31		Beginner	\$82.43					



21) We get the same PivotTable Report without having to use VLOOKUP

22) Compare and Contrast VLOOKUP and Relationships for PivotTable Reports:

- i. VLOOKUP
 1. If you do not have big tables of data, VLOOKUP can be fast and easy for creating a Helper Column on a Proper Data Set.
 2. You must still know VLOOKUP because employers many specifically ask you to use them to create Helper Columns on Proper Data Sets.
 3. Some people find it easier to use VLOOKUP rather than Relationships and the Data Model.
- ii. Relationships and the Data Model
 1. Relationships and the Data Model are in Excel 2013 or later. They are not in earlier versions.
 2. If you have large tables (about 50,000 rows or bigger), then Relationships and the Data Model will help reduce the file size and the workbook will not be slowed down with many formulas.
 3. Some people find it easier to use Relationships and the Data Model rather than VLOOKUP.