

Integrating Excel Workbooks into Power BI



Agenda

- Understanding Excel Integration with Power BI
- Designing Data Models in Microsoft Excel
- Connecting to Excel Data Models from Power BI
- Importing Data Models into Power BI Desktop
- Using the Power BI Publishing for Excel Add-in
- Connecting from Excel to a Power BI Dataset



Microsoft Excel Integration with Power BI

- Excel can be used as a query and data modeling tool
 - Excel provides Power Query and PowerPivot
 - Similar query and data modeling features to Power BI Desktop
 - Power BI can connect to an Excel data model
 - Excel data model can be imported into Power BI Desktop project
- Excel as a tool to publish worksheet content to Power BI
 - Excel worksheets can be rendered inside Power BI workspace
 - Provides best way to create PivotTables in Power BI custom solution
 - **Power BI publisher for Excel** add-in allows publishing to dashboard
- Analyze in Excel Feature
 - Makes it possible to connect Excel workbook to Power BI Dataset
 - Create PivotTables to analyze datasets running in Power BI service



Excel Online Integration with Power BI

- Excel Online used to render Excel workbooks in browser
 - Workbooks in OneDrive & SharePoint can be accessed thru browser
 - Excel Online rendering service can be hosted inside Power BI report



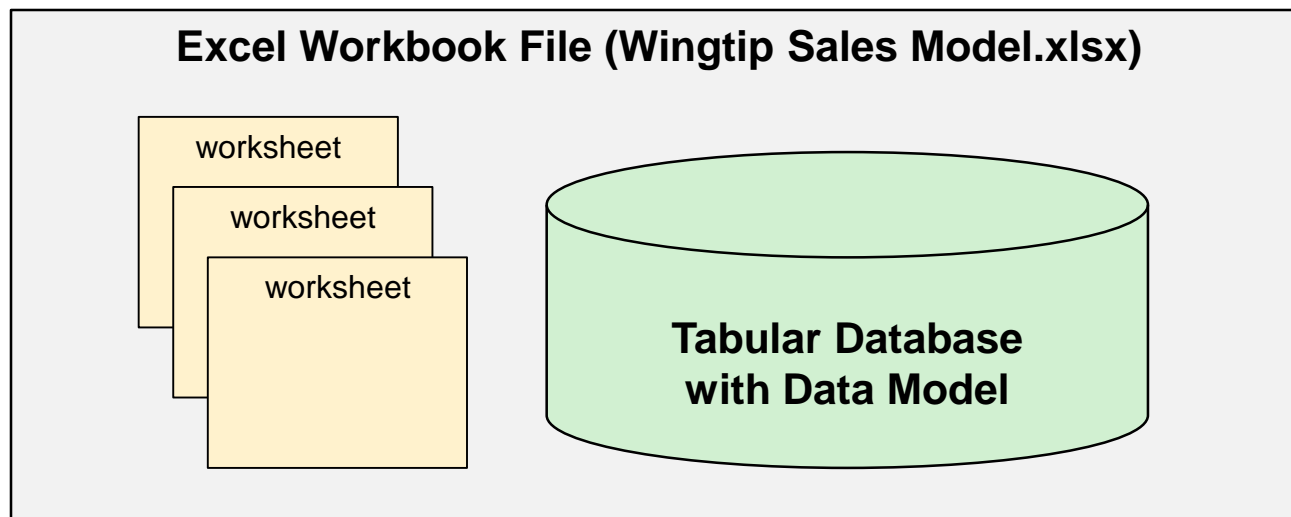
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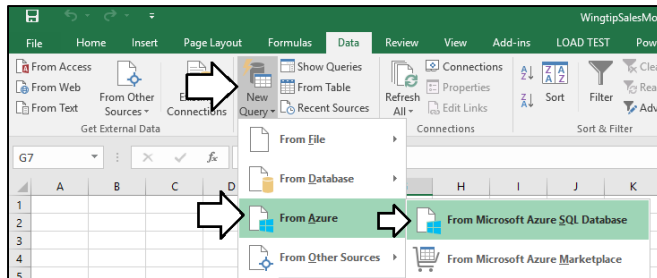
The Excel Data Model

- Every Excel workbook file contains a data model
 - Data model stored as tabular database inside XLSX file
 - Based on **xVelocity** database engine just like PBIDT and SSAS
- When importing data with from an Excel query...
 - You can add the imported data as a table in a worksheet
 - You can add the imported data as a table in the data model

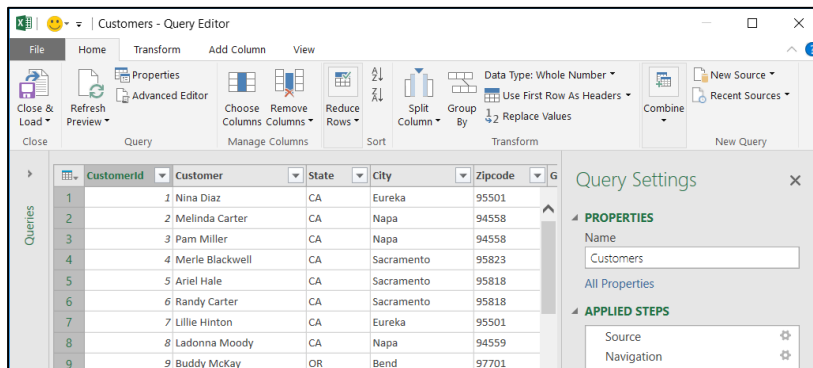


Working with Query Tools in Microsoft Excel

- Microsoft Excel provides query tools similar to PBIDT
 - Included with Excel 2013/2010 using Power Query add-in
 - Included natively in Excel 2016 – Power Query add-in retired
 - Query functionality provided in Query tab in ribbon



- Excel queries are edited in separate Query Editor window



Working with the Power Pivot Add-in

- Data Modeling requires activation of Power Pivot add-in
 - Not activated by default in Excel 2016 or Excel 2013
 - Not activated nor even installed by default in Excel 2010



- Once activated, new **Power Pivot** tab appears in ribbon



Building Data Models in Excel Workbooks

- You create data model just like in Power BI Desktop
 - Convert column types and format column values
 - Add calculated columns using DAX expressions
 - Add measures using DAX expressions
 - Add a calendar table to support DAX time intelligence
 - Add dimensional hierarchies
- Excel data model supports adding KPIs
 - Power BI Desktop does not provide equivalent feature



Using Power Pivot Add-in for Excel

Power Pivot for Excel - Wingtip Sales Model 1.xlsx

File Home Design Advanced

Paste Get External Data Refresh PivotTable

Data Type : Text
Format : Text

\$ % & #

Clear All Filters Sort by Column

Find

AutoSum Create KPI

Diagram View Show Hidden Calculation Area

Clipboard

[Age Group] = SWITCH (TRUE(),
[Age] >= 65, "Ages 65 and over",
[Age] >= 50, "Ages 50 TO 65",
[Age] >= 40, "Ages 40 TO 49",
[Age] >= 30, "Ages 30 TO 39",
[Age] >= 18, "Ages 18 TO 23",
[Age] < 18, "Ages under 18"

	State	City	Zipcode	Gender	State Name	Sales Region	Age	Age Group
1	CA	San Jose	95133	Female	California	Western Region	48	Ages 40 TO 49
2	CA	San Jose	95133	Female	California	Western Region	74	Ages 65 and over
3	CA	San Jose	95133	Female	California	Western Region	73	Ages 65 and over
4	CA	San Jose	95133	Female	California	Western Region	25	Ages 18 TO 23

Measure ? ✕

Table name:

Measure name:

Description:

Formula:

```
=CALCULATE(
    SUM(Sales[SalesAmount]),
    FILTER(
        ALL(Calendar),
        Calendar[Date] <= MAX(Calendar[Date])
    )
)
```

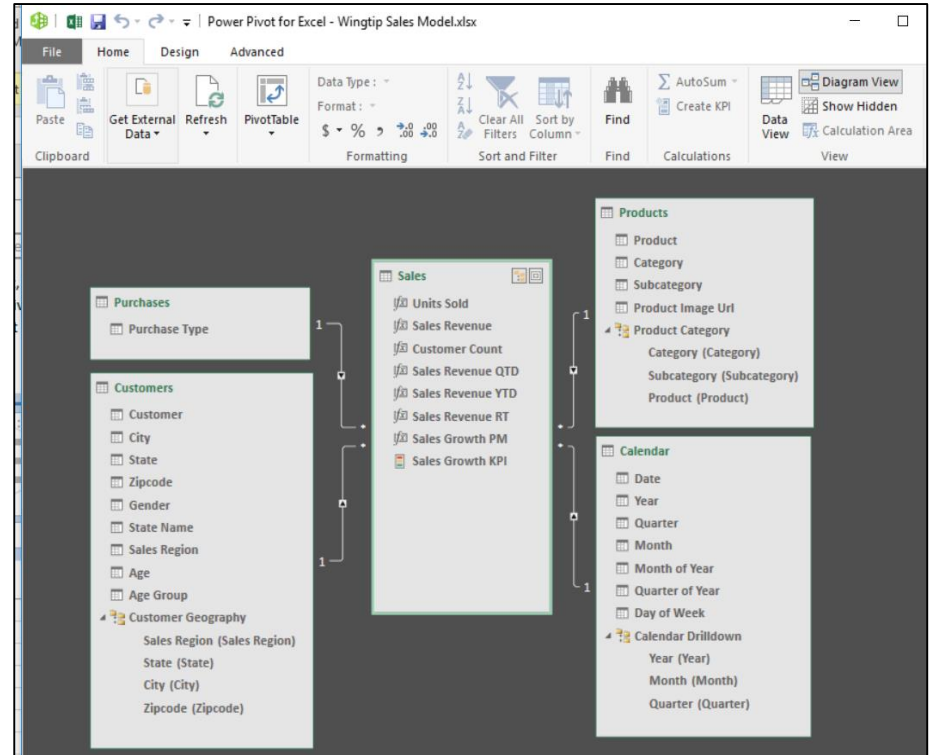
Formatting Options

Category:

Symbol:

Decimal places:

☒ Use 1000 separator (,.)



Adding Hierarchies to an Excel Data Model

- Excel data model supports dimensional hierarchies
 - All column in a hierarchy must be from single table
 - Provides the same effect as dimensional hierarchies in PBIDT
 - Technique for creating hierarchies in Excel different from PBIDT



Creating PivotTables from Excel Data Model

- Excel allows creation of PivotTables from data model
 - PivotTables are very popular with business users and data analysts
 - PivotTable allows user-friendly drilldown during data analysis
 - Excel PivotTables can be published to Excel Online
 - Power BI currently offers no visualization that matches Excel PivotTable

	A	B	C	D	E
1	Customer Location	Customer Count	Sales Revenue	Units Sold	
2	Western Region	25,739	\$12,733,888	1,598,125	
3	Central Region	12,733	\$5,915,449	994,680	
4	Eastern Region	25,211	\$11,081,180	1,959,240	
5	CT	1,219	\$516,478	81,757	
6	Greenwich	409	\$167,352	21,210	
7	New Britain	37	\$17,263	4,139	
8	North Haven	127	\$50,702	9,225	
9	Stamford	142	\$56,437	8,614	
10	Trumbull	220	\$96,771	14,936	
11	Waterbury	56	\$25,604	5,301	
12	Waterford	107	\$46,998	6,012	
13	Windsor	121	\$55,352	12,320	
14	FL	5,897	\$2,592,242	446,167	
15	GA	3,251	\$1,490,282	275,491	
16	MA	1,341	\$543,241	96,465	
17	NC	3,270	\$1,479,238	256,200	
18	NH	559	\$233,917	35,512	
19	NJ	1,151	\$530,241	93,232	
20	NY	2,995	\$1,265,458	231,956	
21	PA	1,831	\$792,634	154,598	
22	RI	468	\$193,897	31,703	
23	SC	1,007	\$439,328	79,195	
24	VA	2,222	\$1,004,225	176,964	
25	Grand Total	63,683	\$29,730,517	4,552,045	
26					
27					

PivotTable Fields

Active All

Choose fields to add to report:

Search

- Σ Sales
- Calendar
- Calendar
- Customers
 - Customer Geography
 - More Fields

Drag fields between areas below:

Filters	Columns
	Σ Values
Rows	Σ Values
Customer Geography	Customer Count
	Sales Revenue
	Units Sold



Creating a Chart from an Excel Data Model

- Excel provides rich charting capabilities
 - Excel charts can also be published to Excel Online



KPIs in an Excel Data Model

- Excel supports adding KPIs to data model
 - KPI created as visual layer on top of a measure
 - Power BI Desktop has no equivalent KPI support
 - Excel KPI can be used in Excel PivotTable

Key Performance Indicator (KPI)

KPI base field (value): Sales Growth KPI

KPI Status

Define target value:

☐ Measure:

☒ Absolute value:

Define status thresholds:

Target

Select icon style:

OK Cancel

Sales Revenue YTD	Sales Revenue RT	Sales Growth PM	Sales Growth KPI Status
\$959,863	\$18,534,277	-41.65 %	🔴
\$1,929,193	\$19,503,607	0.99 %	🟡
\$2,604,726	\$20,179,140	-30.31 %	🔴
\$3,327,182	\$20,901,596	6.95 %	🟡
\$4,025,494	\$21,599,908	-3.34 %	🔴
\$4,811,286	\$22,385,700	12.53 %	🟢
\$5,733,280	\$23,307,694	17.33 %	🟢
\$6,817,469	\$24,391,883	17.59 %	🟢
\$7,906,332	\$25,480,746	0.43 %	🟡
\$9,118,142	\$26,692,556	11.29 %	🟢
\$10,423,171	\$27,997,585	7.69 %	🟡
\$12,156,103	\$29,730,517	32.79 %	🟢
\$12,156,103	\$29,730,517		

PivotTable Fields

Active All

Choose fields to add to report:

Search

☒ Sales Growth PM

☒ Sales Growth KPI

☐ Value (Sales Growth KPI)

☐ Goal

☒ Status

☒ Calendar

☐ Calendar Drilldown

- KPI from Excel data model can be used in Power BI report



Power View Reports in Excel

- Excel 2013 supports creating reports with Power View
 - Power View is reporting layer on top of Excel data model
 - Power View report added as worksheet within workbook file

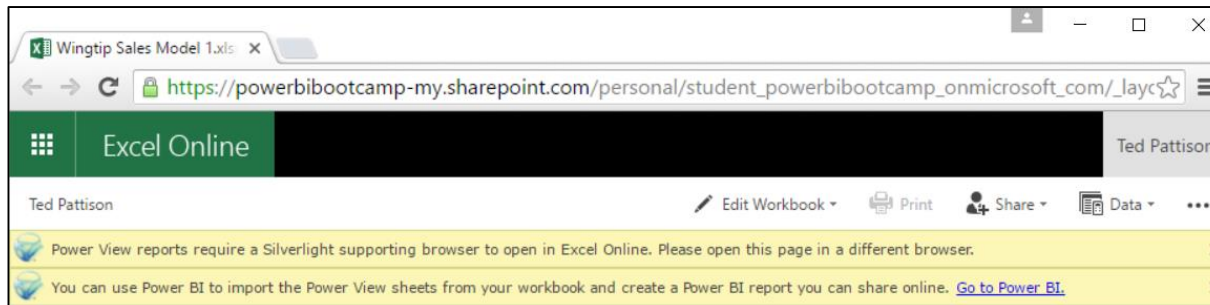


Power View Requires Silverlight

- Use of Power View requires Microsoft Silverlight
 - Required when using Power View in Excel and in Browser
 - Often requires user to install Silverlight



- Silverlight dependencies considered undesirable
 - Power View reports inaccessible to many browsers and mobile devices
 - Microsoft is currently trying to move away from using Silverlight





DEMO

Working with Query and Data Modeling Features in Microsoft Excel

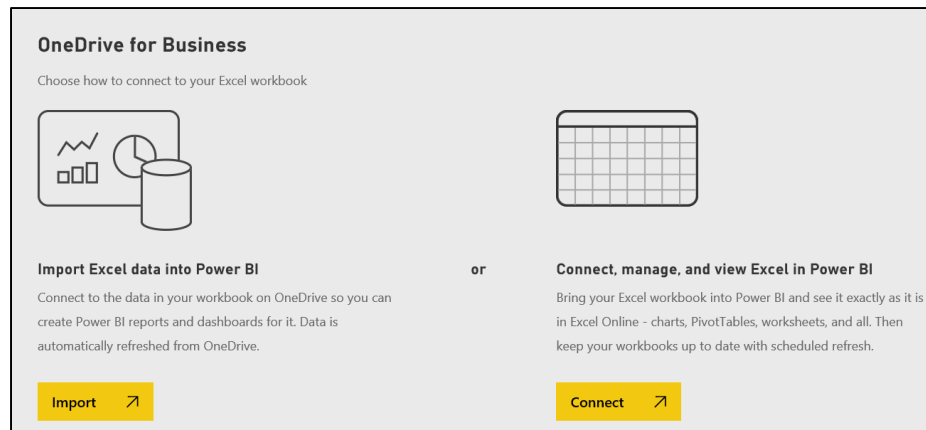
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Connect versus Import

- Connecting to a Workbook from Power BI
 - Data model inside Excel workbook file becomes live source of data
 - Excel Online renders Excel worksheets inside Power BI workspace
 - All visualizations built into Excel workbook preserved "as is"
- Importing a Workbook into Power BI
 - Data model from workbook file is converted into Power BI dataset
 - Power View reports converted to Power BI reports
 - Other visualizations from workbook must be recreated from scratch



Hosting Excel Online inside Power BI

- What happens when you "Connect To" an Excel workbook?
 - Excel workbook renders inside Power BI using Excel Online hosting
 - Makes it easy to add Excel workbooks into Power BI user experience
 - All visualizations built into workbook as leveraged "as is"
 - Best way to provide true PivotTables in Power BI environment

Power BI interface showing an Excel Online workbook titled "Wingtip Sales Model 1". The interface includes a sidebar with navigation options like "Featured dashboard", "Favorites", "My Workspace", "Dashboards", "Reports", and "Datasets". The main area displays the Excel spreadsheet with columns for Month, Sales Revenue, Sales Revenue QTD, Sales Revenue YTD, Sales Revenue RT, Sales Growth PM, and Sales Growth KPI Status. The data is filtered by Year (2012-2015) and Purchase Type (Mail Order Purchase, Online Purchase, Store Purchase). The Grand Total row shows Sales Revenue of \$22,430,354, Sales Revenue QTD of \$4,249,771, Sales Revenue YTD of \$12,156,103, and Sales Revenue RT of \$29,730,517.

Month	Sales Revenue	Sales Revenue QTD	Sales Revenue YTD	Sales Revenue RT	Sales Growth PM	Sales Growth KPI Status
Jan-2014	\$629,969	\$629,969	\$629,969	\$7,930,132	-18.13 %	Red Diamond
Feb-2014	\$609,637	\$1,239,606	\$1,239,606	\$8,539,770	-3.23 %	Red Diamond
Mar-2014	\$628,618	\$1,868,225	\$1,868,225	\$9,168,388	3.11 %	Yellow Triangle
Apr-2014	\$661,588	\$661,588	\$2,529,812	\$9,829,976	5.24 %	Yellow Triangle
May-2014	\$748,193	\$1,409,780	\$3,278,005	\$10,578,168	13.09 %	Green Circle
Jun-2014	\$814,333	\$2,224,114	\$4,092,338	\$11,392,502	8.84 %	Yellow Triangle
Jul-2014	\$788,469	\$788,469	\$4,880,807	\$12,180,970	-3.18 %	Red Diamond
Aug-2014	\$869,143	\$1,657,611	\$5,749,950	\$13,050,113	10.23 %	Green Circle
Sep-2014	\$890,958	\$2,548,569	\$6,640,908	\$13,941,071	2.51 %	Yellow Triangle
Oct-2014	\$988,789	\$988,789	\$7,629,697	\$14,929,860	10.98 %	Green Circle
Nov-2014	\$999,574	\$1,988,363	\$8,629,271	\$15,929,434	1.09 %	Yellow Triangle
Dec-2014	\$1,644,980	\$3,633,343	\$10,274,251	\$17,574,414	64.57 %	Green Circle
Jan-2015	\$959,863	\$959,863	\$959,863	\$18,534,277	-41.65 %	Red Diamond
Feb-2015	\$969,330	\$1,929,193	\$1,929,193	\$19,503,607	0.99 %	Yellow Triangle
Mar-2015	\$675,533	\$2,604,726	\$2,604,726	\$20,179,140	-30.31 %	Red Diamond
Apr-2015	\$722,456	\$722,456	\$3,327,182	\$20,901,596	6.95 %	Yellow Triangle
May-2015	\$698,311	\$1,420,768	\$4,025,494	\$21,599,908	-3.34 %	Red Diamond
Jun-2015	\$785,793	\$2,206,560	\$4,811,286	\$22,385,700	12.53 %	Green Circle
Jul-2015	\$921,994	\$921,994	\$5,733,280	\$23,307,694	17.33 %	Green Circle
Aug-2015	\$1,084,189	\$2,006,183	\$6,817,469	\$24,391,883	17.59 %	Green Circle
Sep-2015	\$1,088,863	\$3,095,046	\$7,906,332	\$25,480,746	0.43 %	Yellow Triangle
Oct-2015	\$1,211,810	\$1,211,810	\$9,118,142	\$26,692,556	11.29 %	Green Circle
Nov-2015	\$1,305,029	\$2,516,839	\$10,423,171	\$27,997,585	7.69 %	Yellow Triangle
Dec-2015	\$1,732,932	\$4,249,771	\$12,156,103	\$29,730,517	32.79 %	Green Circle
Grand Total	\$22,430,354	\$4,249,771	\$12,156,103	\$29,730,517		

"Connecting To" a Power View Report

- When connecting to workbook with Power Reports...
 - Excel Online can render Power View reports in Power BI service
 - Requires a Silverlight-enabled browser – this can be a pain point





DEMO

Connecting to an Excel Workbook with a Data Model

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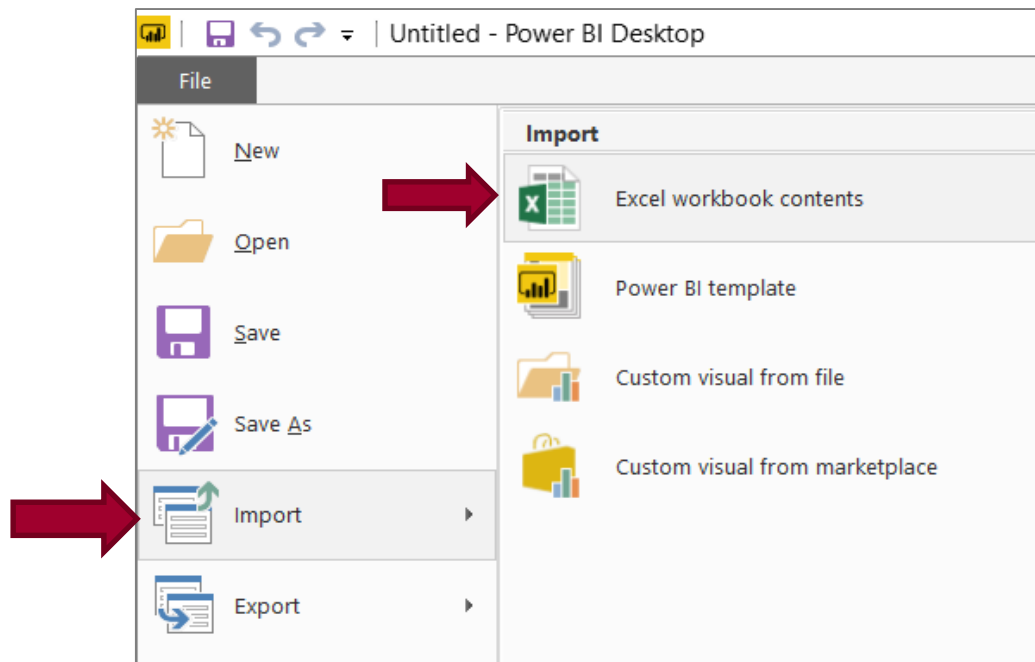
Importing Excel Data Models into Power BI

- Two way to import Excel Data Model into Power BI
 - Import data model into Power BI service using browser
 - Import data model into new Power BI Desktop project
- Importing data model into Power BI service is limited
 - Power BI imports read-only copy of data model
 - Any modifications to data model must be made through Excel
 - All data refreshing must be accomplished manually through Excel
- Importing data model into Power BI Desktop is better
 - Importing removes dependencies on source Excel workbook
 - Imported dataset can be modified in Power BI Desktop
 - Imported dataset can be configured for server-side refresh

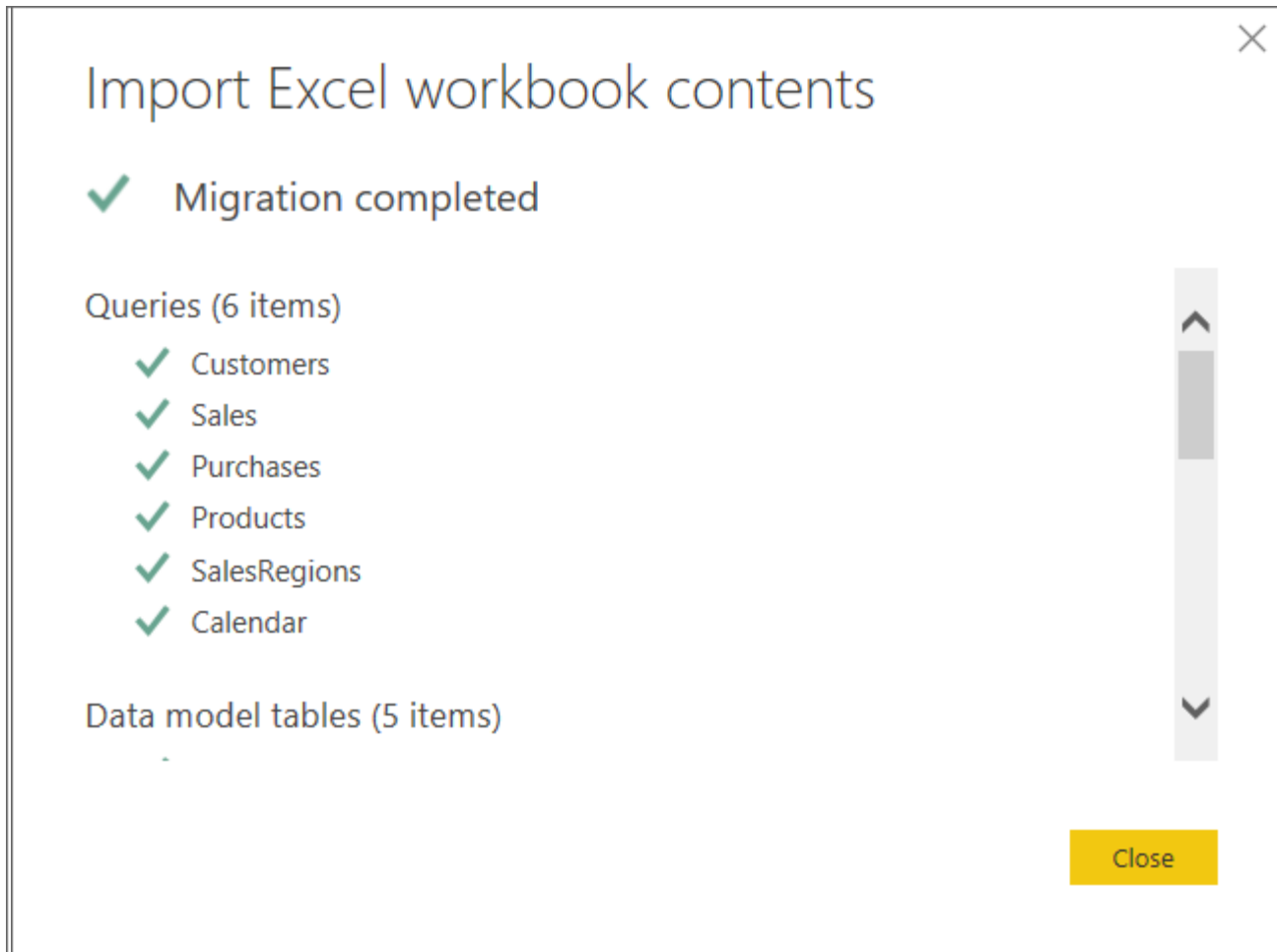


Importing Data Model into Power BI Desktop

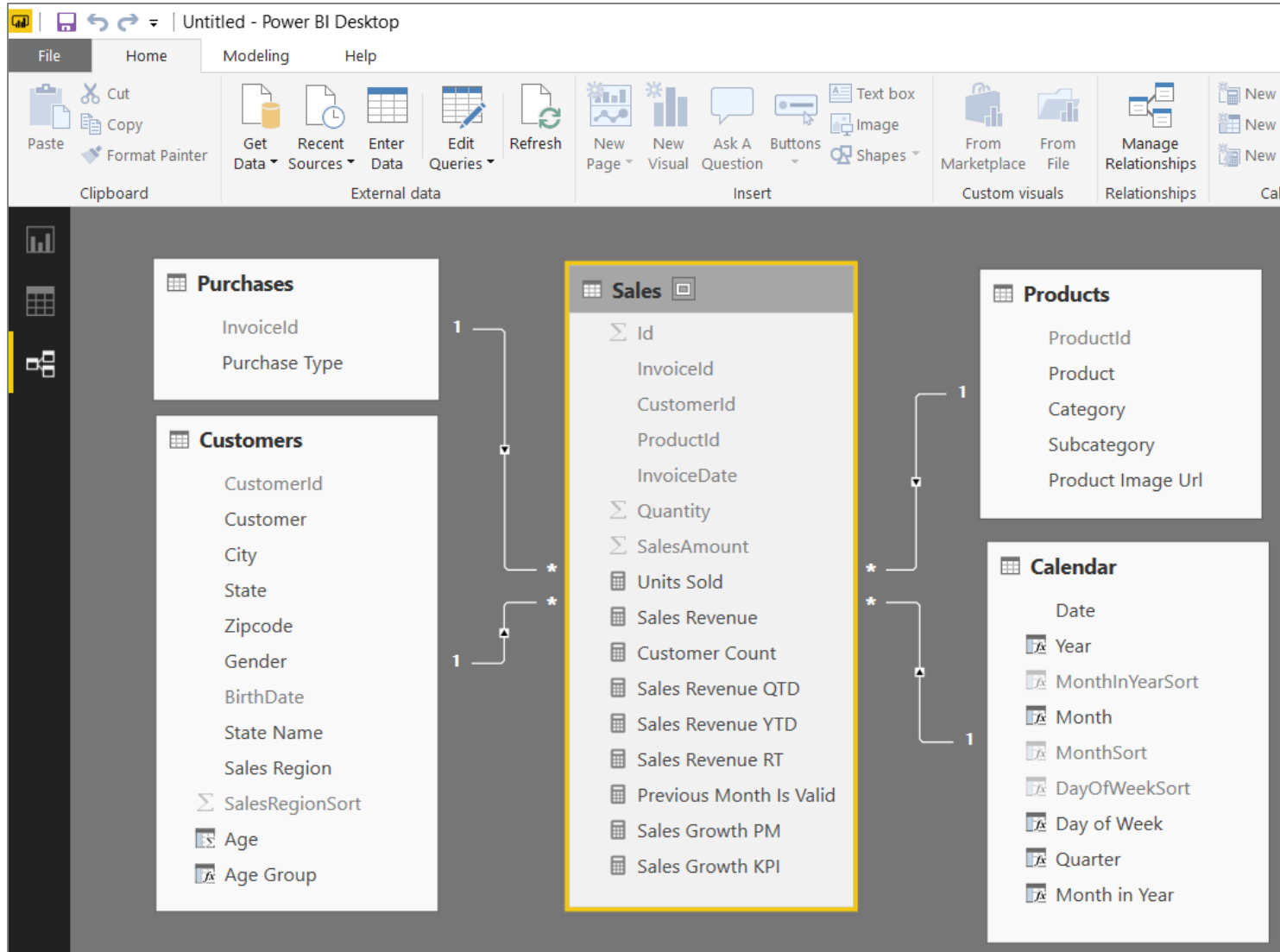
- Data model must be imported into new project
 - Accomplished using **Import > Excel workbook contents**
 - You cannot import a dataset into an existing project



The Data Model Import Process



Inspecting the Imported Data Model



Inspecting the Project Data Sources


×

Data source settings

Manage settings for data sources that you have connected to using Power BI Desktop.

☒ Data sources in current file ☐ Global permissions

A Z ↓

 cpt.database.windows.net;WingtipSalesDB

Change Source...

Edit Permissions...

Clear Permissions ▼

Close



Modifying the Data Model

- DAX code is now editable

The screenshot displays the Microsoft Power BI Desktop application. The top ribbon includes tabs for File, Home, Modeling, and Help. The Modeling tab is active, showing various tools for data manipulation. The main area is divided into a DAX editor on the left and a data table on the right.

DAX Editor:

```
Age Group = SWITCH( TRUE(),  
    [Age] >= 65, "Ages 65 and over",  
    [Age] >= 50, "Ages 50 TO 65",  
    [Age] >= 40, "Ages 40 TO 49",  
    [Age] >= 30, "Ages 30 TO 39",  
    [Age] >= 18, "Ages 18 TO 23",  
    [Age] < 18, "Ages under 18"  
)
```

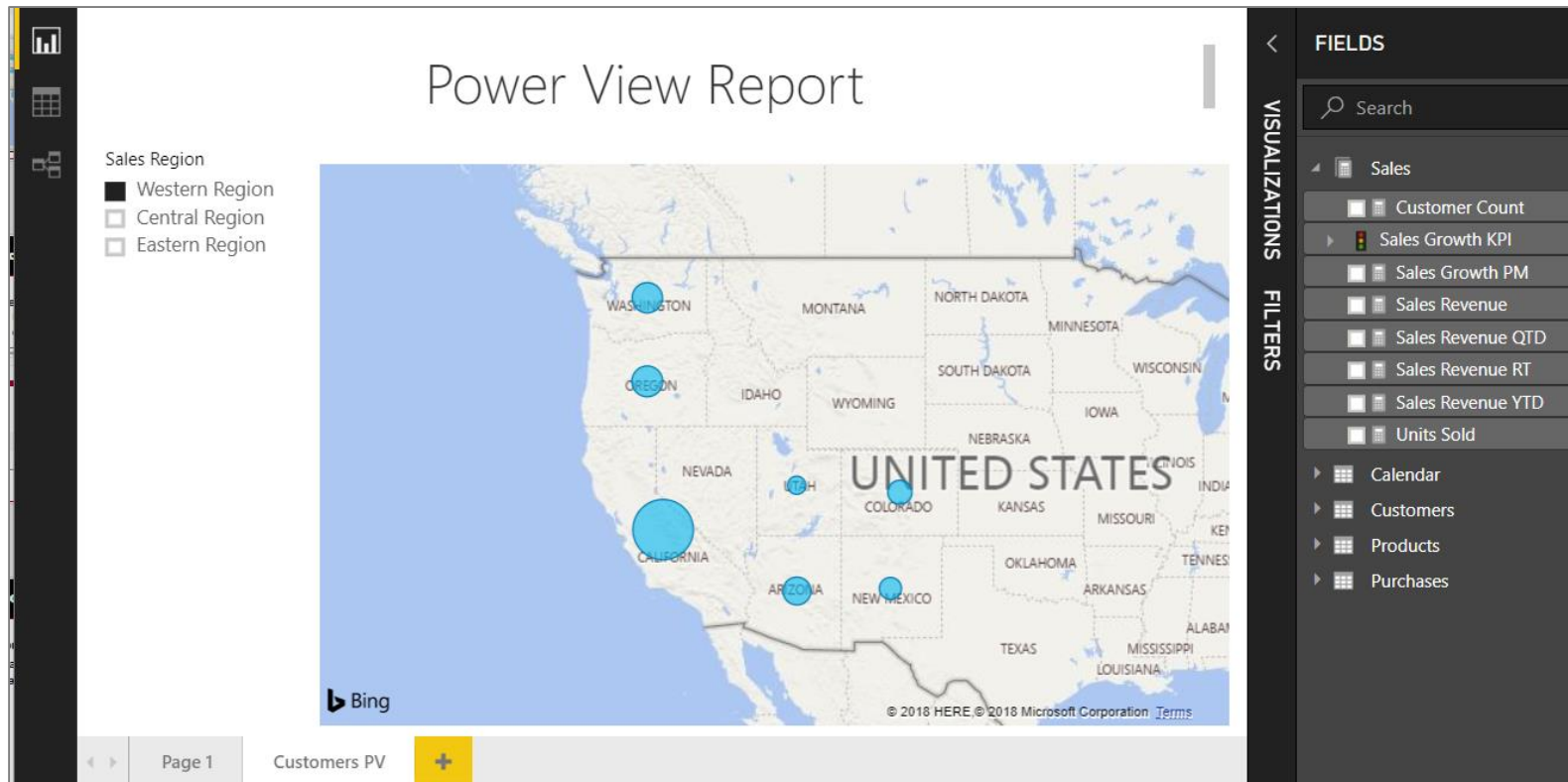
Data Table:

CustomerId	Customer	City	State	Zipcode	Gender	BirthDate	State Name	Sales Region	SalesRegionSort	Age	Age Group
760	Lucile Blake	San Jose	CA	95133	Female	3/16/1968 12:00:00 AM	California	Western Region	1	50	Ages 50 TO 65
881	Rochelle Owen	San Jose	CA	95133	Female	7/19/1942 12:00:00 AM	California	Western Region	1	75	Ages 65 and over
940	Corinne Finch	San Jose	CA	95133	Female	3/7/1943 12:00:00 AM	California	Western Region	1	75	Ages 65 and over
1119	Twila Massey	San Jose	CA	95133	Female	9/3/1990 12:00:00 AM	California	Western Region	1	27	Ages 18 TO 23



Power View Report Migration

- Power View Reports are migrated to new project
 - Built using standard Power BI visuals (no Silverlight)
 - All other visualizations must be built from scratch ☹️





DEMO

Importing an Excel Workbook with a Data Model into Power BI Desktop

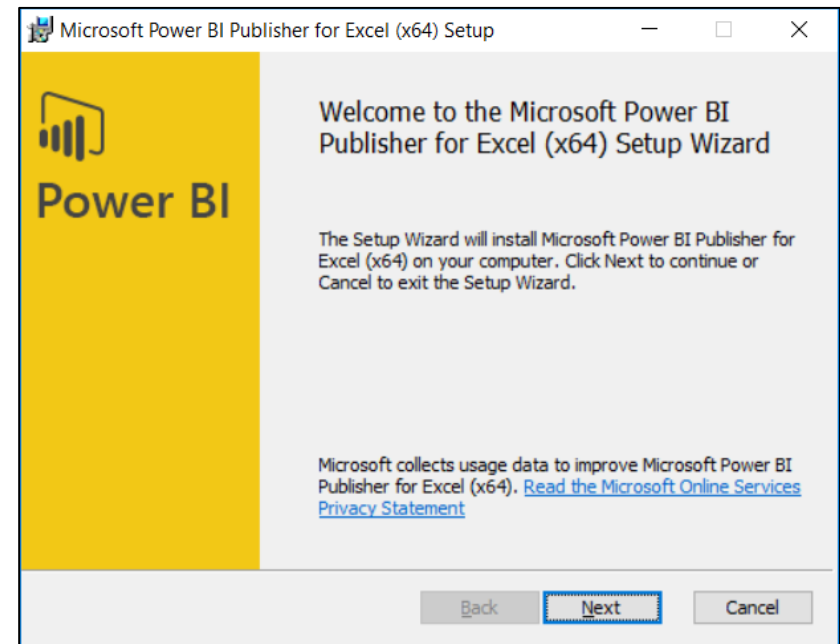
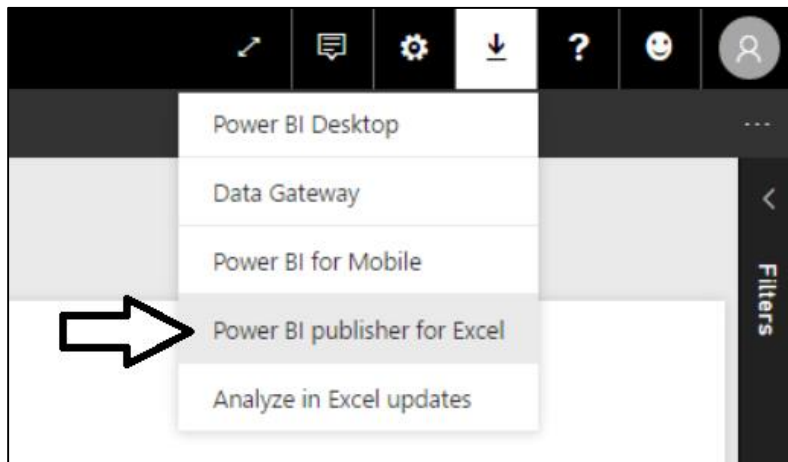
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Power BI Publisher for Excel Add-in

- What is the Power BI Publisher for Excel Add-in?
 - An add-in that you first must download and install
 - A utility to pin Excel elements to Power BI dashboard
 - Worksheet elements are pinned as non-dynamic snapshots
 - Pinned elements can be updated manually when needed



Pinning an Excel Chart to a Dashboard

The screenshot shows the Microsoft Excel interface with the 'Power BI' tab selected. A 'Pin to dashboard' dialog box is open, allowing the user to pin a chart to a dashboard. The dialog box has two main sections: 'Select a workspace to pin to.' and 'Where would you like to pin to?'. The 'New dashboard' option is selected under the second section. The 'Ok' button is highlighted with a green box.

Pin to dashboard

Select a workspace to pin to.

My Workspace

Where would you like to pin to?

☐ Existing dashboard

☒ New dashboard

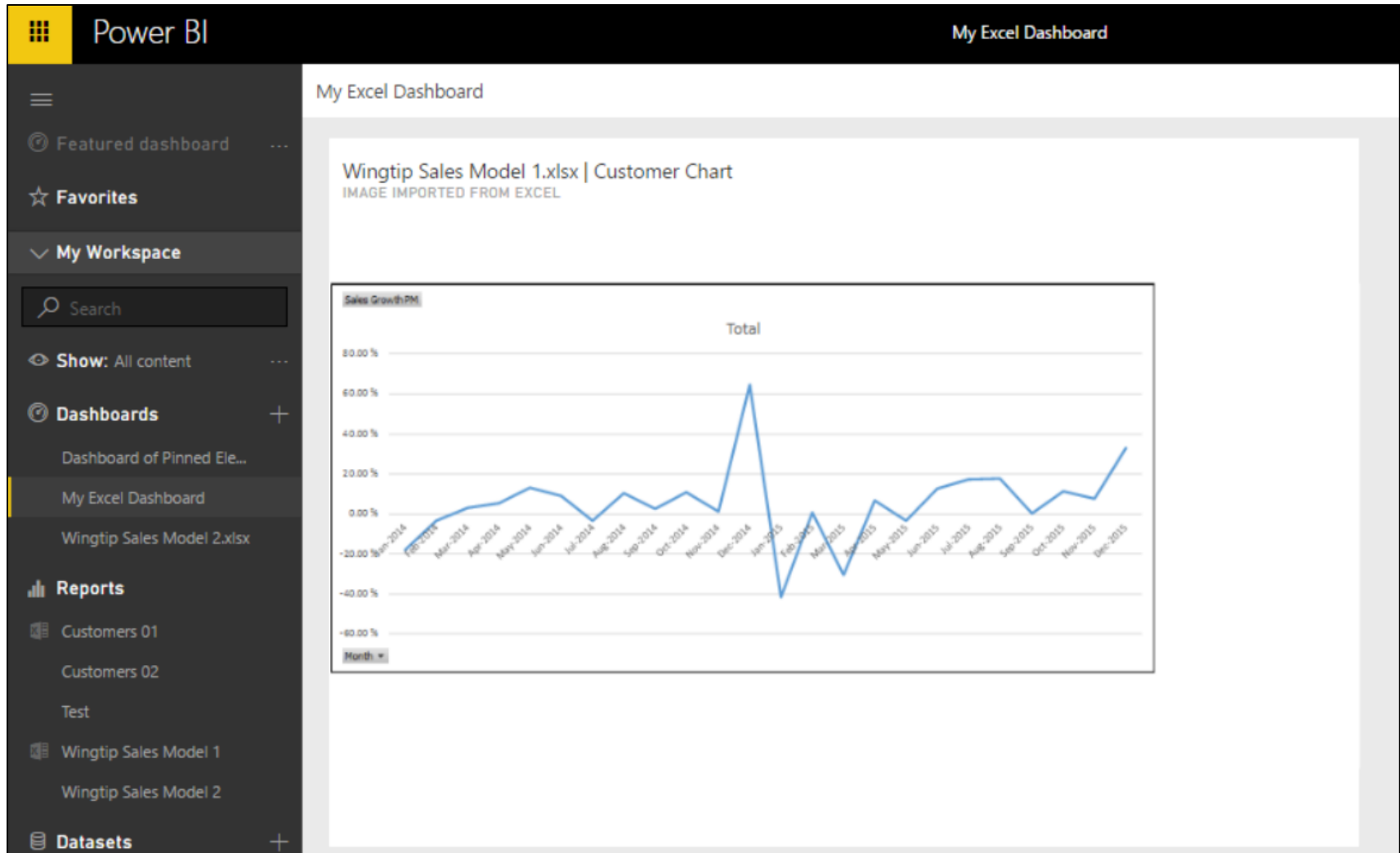
My Excel Dashboard

Ok Cancel

The background shows an Excel spreadsheet with a line chart and a table of data. The chart is titled 'Wingtip Sales Model 1.xlsx | Custom...' and is labeled 'IMAGE IMPORTED FROM EXCEL'. The chart shows a line graph with a peak in the middle. The table below the chart has columns for 'Year' and 'Month'.

Year	Month
2012	
2013	
2014	
2015	

A Pinned Excel Chart in a Dashboard



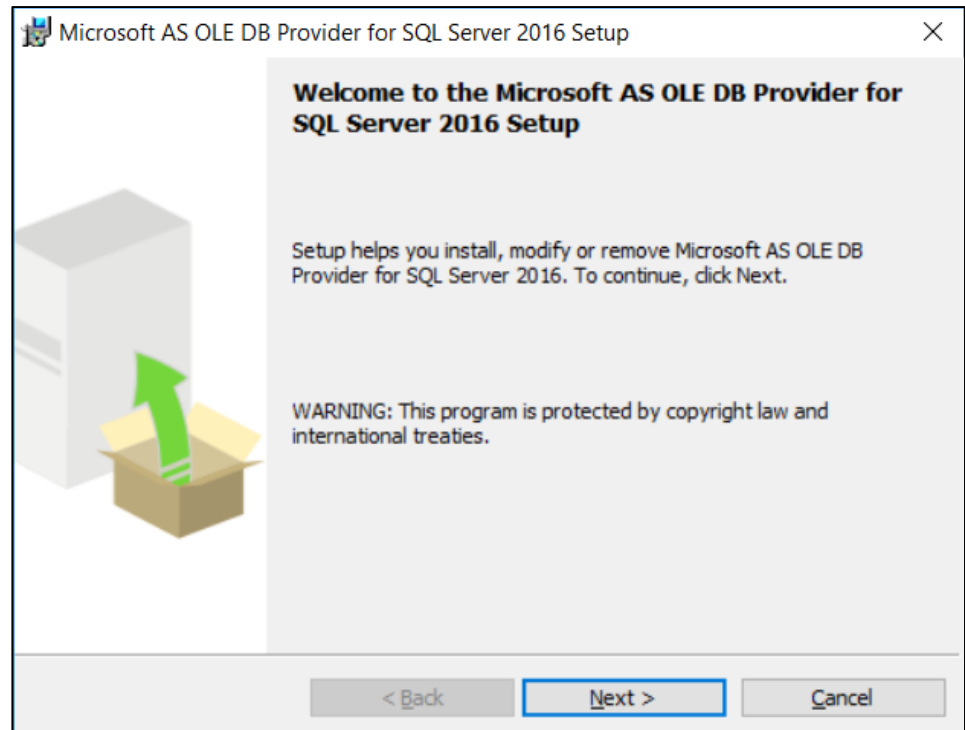
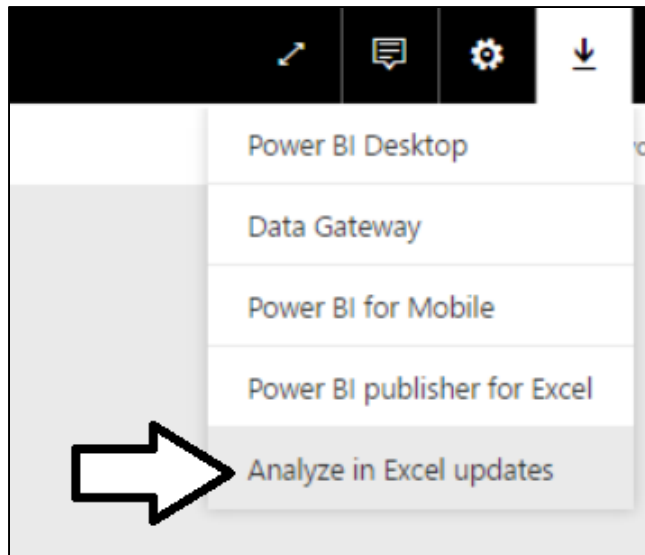
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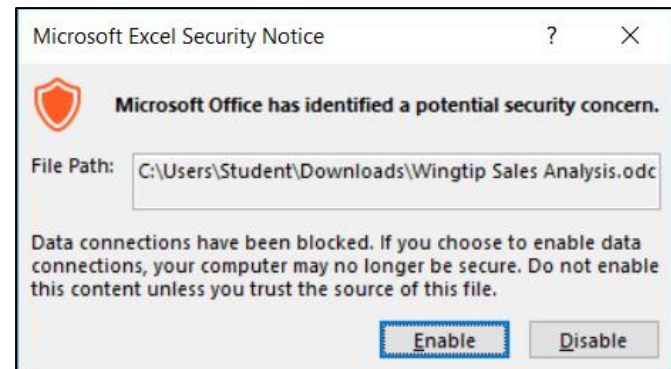
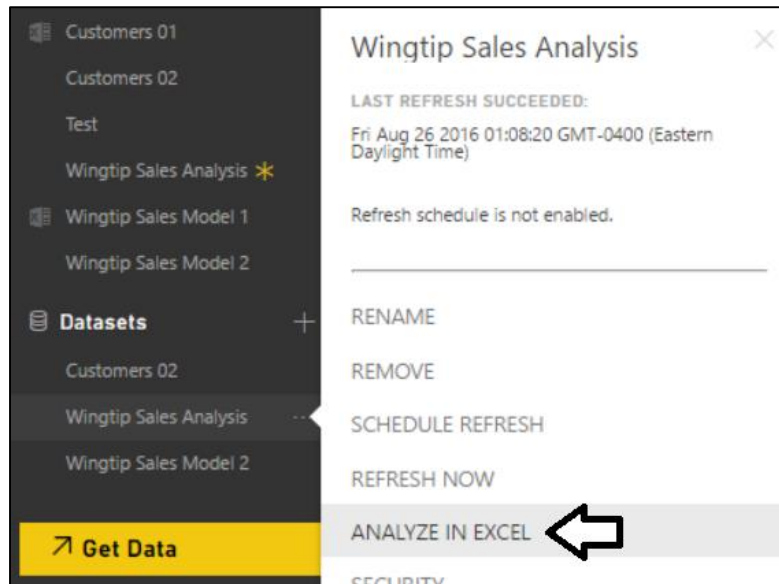
Analyze in Excel

- Feature to connect Excel worksheet to Power BI dataset
 - Requires downloading & installing drivers using setup program
 - Once installed, connection is created from within Power BI service



Creating a Connected Workbook

- Dataset provides ANALYZE IN EXCEL menu command
 - Used to create new Excel workbook with connection to dataset
 - Creation of new workbook triggered by download of **.ODC** file
 - Connecting can require user to enable data connections



Analyzing a Power BI Dataset in Excel

- Once you connect Excel workbook to a Power BI dataset
 - You can analyze data just as it were from local data model
 - Power BI dataset plays the role of SSAS in the cloud

	A	B	C	D	E
1	Row Labels	Sales Revenue	Sales Revenue QTD	Sales Revenue YTD	Sales Revenue RT
2	Action Figures	\$10,166,653	\$1,329,609	\$3,973,086	\$10,166,653
3	Cute and Huggable	\$4,949,464	\$502,033	\$1,616,758	\$4,949,464
4	Tough Guys	\$5,217,189	\$827,577	\$2,356,328	\$5,217,189
5	Batman Action Figure	\$225,012	\$31,634	\$88,011	\$225,012
6	Captain America Action Figure	\$855,607	\$142,463	\$408,883	\$855,607
7	GI Joe Action Figure	\$294,231	\$41,800	\$123,592	\$294,231
8	Godzilla Action Figure	\$2,970,735	\$492,745	\$1,379,383	\$2,970,735
9	Green Hulk Action Figure	\$144,842	\$19,810	\$57,292	\$144,842
10	Red Hulk Alter Ego Action Figure	\$28,149	\$3,980	\$11,651	\$28,149
11	Spiderman Action Figure	\$698,614	\$95,144	\$287,516	\$698,614
12	Arts and Crafts	\$4,023,339	\$187,779	\$566,371	\$4,023,339
13	Drawing	\$2,312,202	\$143,174	\$446,491	\$2,312,202
14	Painting	\$1,711,137	\$44,605	\$119,880	\$1,711,137
15	Remote Control Vehicles	\$15,540,525	\$2,732,383	\$7,616,646	\$15,540,525
16	Boats	\$175,393	\$30,742	\$77,597	\$175,393
17	Cars	\$1,917,031	\$331,980	\$936,237	\$1,917,031
18	Helicopter	\$4,294,071	\$773,454	\$2,126,758	\$4,294,071
19	Planes	\$6,166,673	\$1,116,375	\$3,116,069	\$6,166,673
20	Trucks	\$2,987,358	\$479,832	\$1,359,985	\$2,987,358
21	Grand Total	\$29,730,517	\$4,249,771	\$12,156,103	\$29,730,517
22					
23					

PivotTable Fields

Show fields: (All)

Search

Products

- Product Category
- More Fields

Drag fields between areas below:

Filters	Columns
	Σ Values

Rows	Σ Values
Product Category	Sales Revenue
	Sales Revenue QTD
	Sales Revenue YTD
	Sales Revenue RT





DEMO

Using the Analyze in Excel Feature

Summary

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