

Sum Product

NEWSLETTER #71 - October 2018

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We aim to put you in a **DAYS** this month as we show

you how to calculate the number of times a particular weekday occurs in a month. I suppose with the A to Z of Excel Functions this month, we have financial modelling pretty much **COVAR'd** (*groan – Ed*).

Our new series on VBA, *Visual Basics*, continues joining Power Query Pointers, the Keyboard Shortcuts and all of the Power BI updates. With further news on the book and how to get it, there's plenty to feast upon.

Happy reading and see you next month.

Liam Bastick, Managing Director, SumProduct

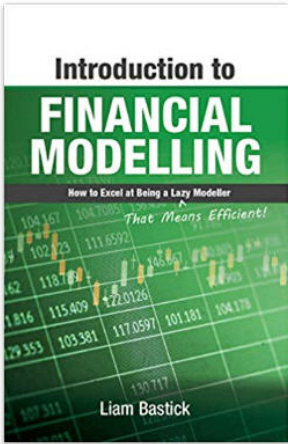


Amazin' Amazon Book...

Finally! Kudos to the team as we have finally got our proverbials together and listed Introduction to Financial Modelling on Amazon (so far, listed on the Australian website but we are working on others!).

Books Best Sellers New Releases Children's Books Textbooks Australian Authors Kindle Books Audiobooks

Books > Business & Economics



Introduction to Financial Modelling Paperback – 1 Jul 2018
by [Liam Bastick](#) (Author), [Tim Heng](#) (Editor)
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Paperback
\$65.00 ✓prime
1 New from \$65.00

Want it delivered by tomorrow, 6 Sep.? Order within 7 hrs and 50 mins and choose **Priority Delivery** at checkout.

Let's be honest: if you are reading this, you are either seeking a cure for insomnia or seeking out better methods of constructing financial models to avoid working late nights. Whichever way you look at it, this book can assist you with your sleeping patterns. If you have had little formal training in developing financial forecasts in Excel or have ever burnt the midnight oil trying to get a Balance Sheet to balance, then this book is for you. A simple walkthrough of the common perils and pitfalls of financial modelling, this book constructs a solid foundation to build upon (pun most definitely intended). Taking little for granted, Liam examines the common Excel functions and functionalities necessary, emphasises the importance of a standardised and functional layout explains accounting concepts simply and reinforces [Read more](#)

[See all 2 images](#)

This book was instigated by the author, Excel MVP Liam Bastick's belief that there was no definitive book on the market to show would-be modellers how to initiate development of a three-way integrated financial model. It takes readers through what are the key Excel functions and features (and why), and then explains the rationale of why a model should be built in a particular way in a particular order. Liam has built models for over 30 years now and wants to share the secrets of Keep It Simple Stupid!

Based on many of our training courses, this simple book explains how to avoid many of the trials, traps, tribulations and pitfalls of modelling in a structured, concise and transparent manner. The Table of Contents is detailed here.

Although aimed at those with just some knowledge of accounting / finance and Excel, even more advanced users have provided the feedback, "...I wish someone had shown me this when I first started out".

For those who would rather order it directly, it can still be purchased from us too, simply drop us a line at contact@sumproduct.com for more details.

Out and About in October

October is another hectic month for us. It kicks off with trips to Manila, Milan and London, with CPA Australia events around Australia too – combined with our usual Excel training. And that’s just what it looks like at the time of writing!



If you would like to catch up with us, drop us a line at contact@sumproduct.com and we’ll try to swing by. If you’re elsewhere, we might be on our way soon – with journeys lined up to almost anywhere with a vowel in it (sorry Poland). More details soon...

Friday on My Mind

We often get asked by my clients “...can I do this?” or “...can I do that?” in Excel. I have yet to find something that Excel has not managed to solve. No doubt there’s a reader out there that can stump us but we haven’t found them yet!

Often, when building monthly forecasting models, one or more days of the week may be a key driver of analysis. For example, pubs and bars may find their highest takings are on Fridays and sporting events may have greater attendances at the weekends, etc. Therefore, modellers often need to know how many Fridays (say) there are in any particular month.

The answer is:

=4+(DAY(DATE(year, month,35))<WEEKDAY(DATE(year,month,1)-weekday_number))

However, I think I need to provide a little more explanation.

To calculate this, I will need to use a particular Excel function, **WEEKDAY(serial_number,[return_type])**, which has the following arguments:

- **serial_number**: this is a required sequential number that represents the date of the day you are trying to find. Dates should be entered by using the DATE function, or as results of other formulas or functions. Problems can occur if dates are entered as text;
- **return_type**: this is a number that determines the type of return value. By default (or if not entered), this will return a value of 1 for Sunday, 2 for Monday, through to 7 for Saturday. I recommend not changing this default as this can cause problems with earlier versions of Excel.

But before I explain how this is used, let me explain my rationale for the calculation.

The whole underlying concept revolves around the five week month. If there were five weeks / 35 days in each month, then it would not matter which day of the week you chose. There would be five Tuesdays, five Saturdays and so on. Similarly, if each month only had four weeks / 28 days, like a non-leap year February, any particular would occur four times in the month. The problem is, the number of days in the month lies between 28 and 31 days.

Therefore, I consider what “date” the 35th of a particular month is. For example, June has 30 days, so 35 June is actually 5 July, so the date would be 5. That means there would be two days of the week (7 – 5) that would occur five times in June, specifically whatever day 1 June and 2 June fall on.

Therefore =7-DAY(DATE(year, month,35)) tells us how many days of the week will occur five times for a given month and year. It is this idea I will expand upon.

=WEEKDAY(DATE(year,month,1))

tells me what day of the week the first day of a given **month** and **year** is. If it were Tuesday, for example, and =7-DAY(DATE(Year, Month,35)) is equal to 3, this would mean there were five Tuesdays, Wednesdays and Thursdays in that month (i.e. Tuesday 1, 8, 15, 22 and 29; Wednesday 2, 9, 16, 23 and 30; Thursday 3, 10, 17, 24 and 31).

I’m nearly there; the following formula gives us what we need.

=4+(DAY(DATE(year,month,35))<WEEKDAY(DATE(year,month,1)-weekday_number))

Let me explain:

- The 4 at the beginning is the minimum number of occurrences of a particular day in any given month. Yes, I don't like it's been hardcoded either.
- The remainder is a condition, which will either be TRUE or FALSE. Now $4 + \text{TRUE} = 5$ whilst $4 + \text{FALSE} = 4$, so this condition evaluates if the fifth occurrence will happen.
- As discussed above, **DAY(**DATE(year, month,35)**)** will give rise to a value of 4, 5, 6 or 7, depending upon whether there are 31, 30, 29 or 28 days in the month respectively. That is, for these numbers of days, there will be 3, 2, 1 or zero days which occur five times.
- If **WEEKDAY(**DATE(year,month,1)**)** is the weekday_number of the day of the week being considered, then **DATE(year,month,1)-weekday_number** will always return the date of the last Saturday of the prior month.
- For example, 1 April 2020 is a Wednesday and it is the number of Wednesdays we want to count in April. The **weekday_number** of Wednesday is 4; four days before 1 April 2020 is 28 March 2020, which is the last Saturday of the prior month; **WEEKDAY(28 March 2020)** is 7. **DAY(**DATE(2020,4,35)**)** is 5, and since $5 < 7$, there will be five Wednesdays in April 2020.
- If the day of the week being considered is the second day of the given month, then **DATE(year,month,1)-weekday_number** will always return the date of the last Friday of the prior month.
- For example, 1 February 2020 is a Saturday and let me assume we are considering how many Sundays there are in February 2020 (i.e. Sunday is the second day of the month). The **weekday_number** of Sunday is 1; one day before 1 February 2020 is 31 January 2020, which is the last Friday of the prior month; **WEEKDAY(31 January 2020)** is 6. **DAY(**DATE(2020,2,35)**)** is 6, and since 6 is not strictly less than 6, there will be four Sundays in February 2020.

- Similarly, if the day of the week being considered is the third day of the given month, then **DATE(year,month,1)-weekday_number** will always return the date of the last Thursday of the prior month.
- For this final example, 1 October 2020 is a Thursday and let me assume we are considering how many Saturdays there are in October (i.e. Saturday is the third day of the month). The **weekday_number** of Saturday is 7; seven days before 1 October 2020 is 24 September 2020, which is the last Thursday of the prior month; **WEEKDAY(24 September 2020)** is 5. **DAY(**DATE(2020,10,35)**)** is 4, and since $4 < 5$, there will be five Saturdays in October 2020.
- Hence this formula will count the number of occurrences of a particular weekday for a given month and year.

There are issues with the above formula:

- The formula cited assumes **WEEKDAY()** is used with its default settings (Sunday = 1, Monday = 2, ..., Saturday = 7). If this is changed, the formula will need to be revised accordingly;
- The Earth goes around the sun once every 365.2422 days (I am available for trivia nights!) and hence not every fourth year is a leap year. If a year ends in '00' (e.g. 2000), the year must be divisible by 400 – not four – to be a leap year. However, Excel's dates / serial numbers do not work like this "...to be compatible with Lotus 1-2-3..." so this formula should only be used for months between January 1901 and December 2099. Hopefully, this is an acceptable limitation...
- Given how serial numbers used to differ between the Macintosh and Windows operating systems, be careful of using this formula if end users will be using both of these systems.
- And finally, please don't write in to comment on the existence of hard code in the given formula. Regular readers will note I abhor hard code (other than 0 or 1) in formulae, but where a number cannot change (as here in two instances with 4 and 35), hopefully you will accept I "tolerate" this exception!

Illustrative Calculations

Assumptions

Start Year

Weekday

Ouputs

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2020	4	4	5	4	5	4	4	5	4	4	5	4
2021	5	4	4	4	5	4	4	5	4	5	4	4
2022	5	4	4	4	5	4	5	4	4	5	4	4
2023	5	4	4	5	4	4	5	4	4	5	4	5
2024	4	4	5	4	4	5	4	4	5	4	4	5

Visual Basics


It's not all about the Power Tools, you know. We thought we'd run a new elementary series going through the rudiments of Visual Basic for Applications (VBA) as a springboard for newer users. This second part looks at how to record a macro.

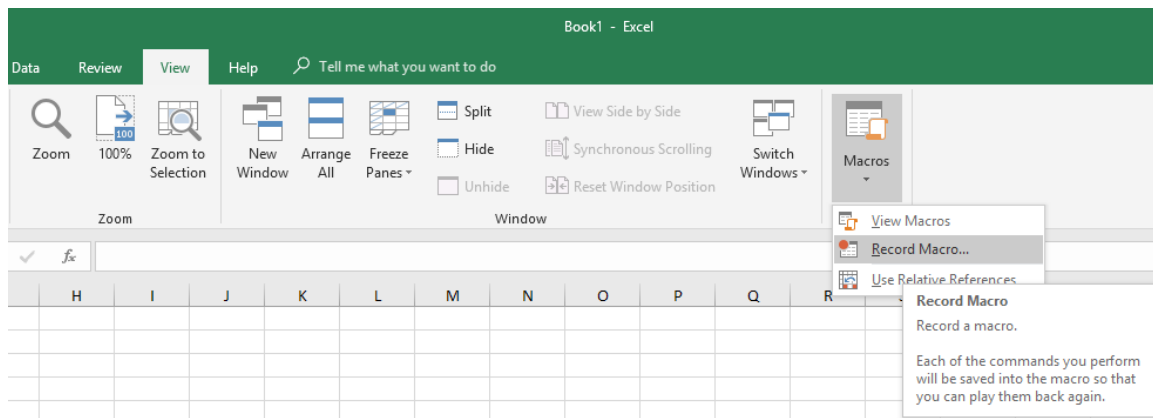
Recording a macro is pretty straightforward and is the typical well users get their feet under the table with VBA. There are several ways you can do this:

1. From the 'View' tab on the Ribbon
2. From the 'Developer' tab on the Ribbon
3. From the Status Bar
4. Keyboard shortcut.

Let's take a brief look at each in turn.

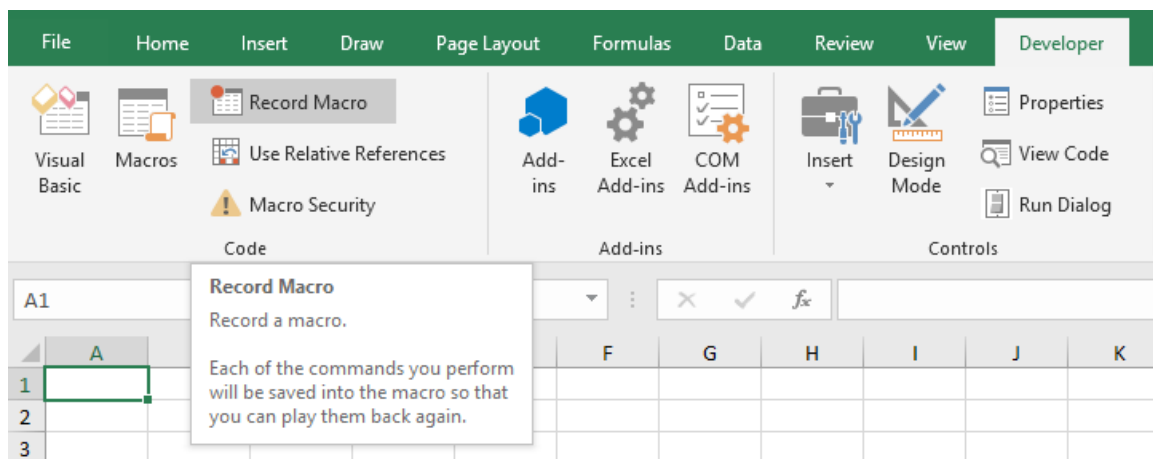
1. From the 'View' tab on the Ribbon

In the 'View' tab of the Ribbon, there is a category called 'Macros' with a 'Macros' button, funnily enough. Click on the button and a drop-down menu will appear. Select 'Record Macro...'.




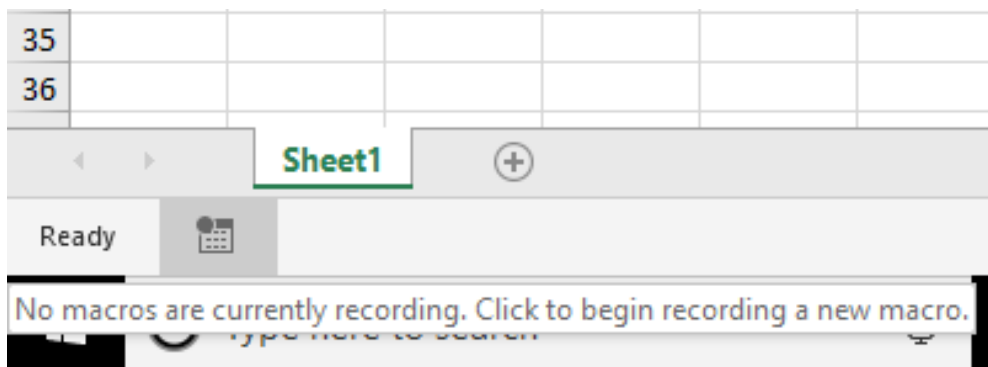
2. From the 'Developer' tab on the Ribbon

Similarly, in the 'Code' grouping on the 'Developer' tab and then select 'Record Macro', viz.



3. From the Status Bar

We can find a small button next to the word 'Ready' in the status bar at the bottom of Excel.



After pressing a "Record Macro" the Record Macro dialog box will appear.

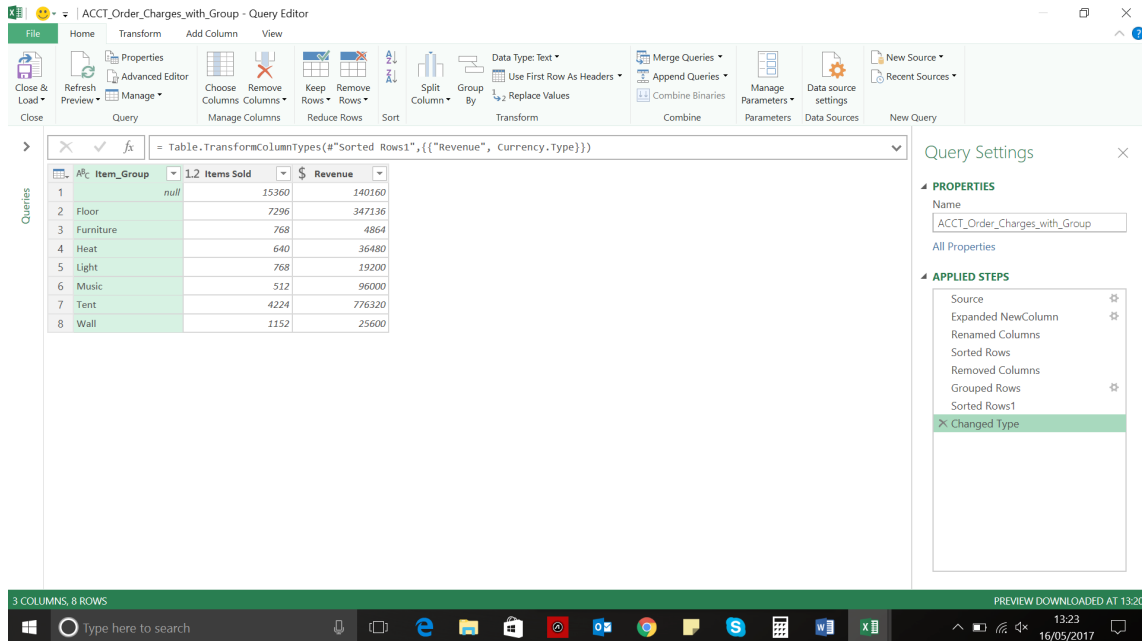
4. Keyboard shortcut

Perhaps not the easiest keyboard shortcut in the world to remember, **ALT + W + M + R** activates the first method ('View' tab on the Ribbon). It also stops the macro recording. This keyboard shortcut isn't pretty, but it's robust. The 'Developer' tab isn't always on the and the status bar has no readily accessible shortcut.

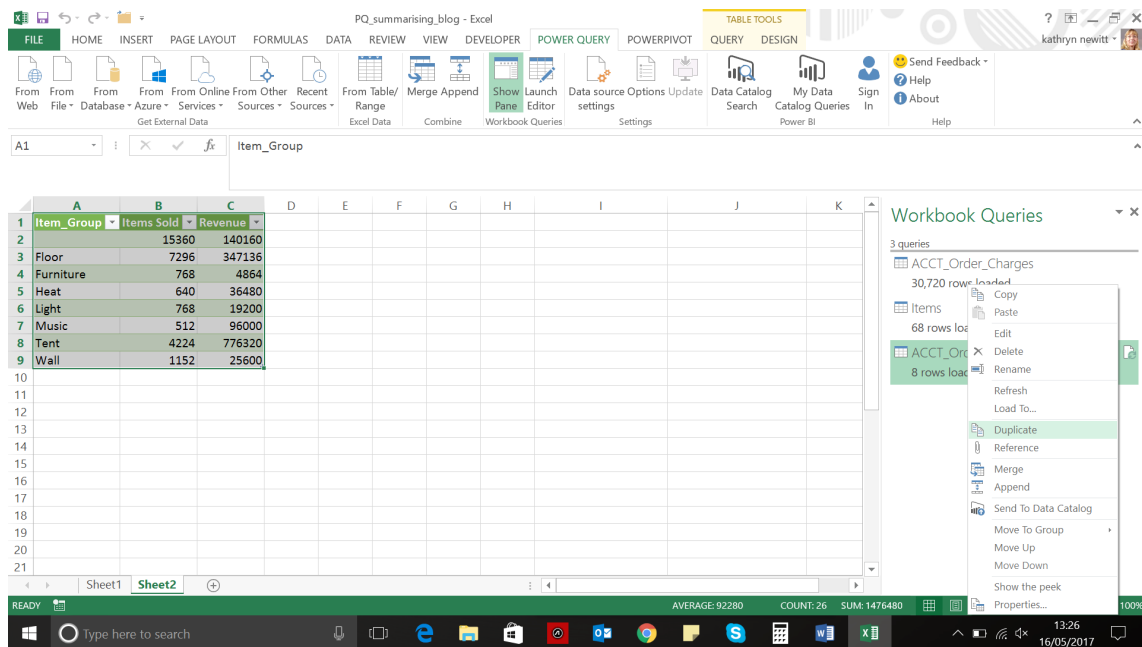
Power Query Pointers

Each month we'll reproduce one of our articles on Power Query (Excel 2010 and 2013) / Get & Transform (Excel 2016) from www.sumproduct.com/blog. If you wish to read more in the meantime, simply check out our Blog section each Wednesday. This month, we look at a way of extracting data from groupings.

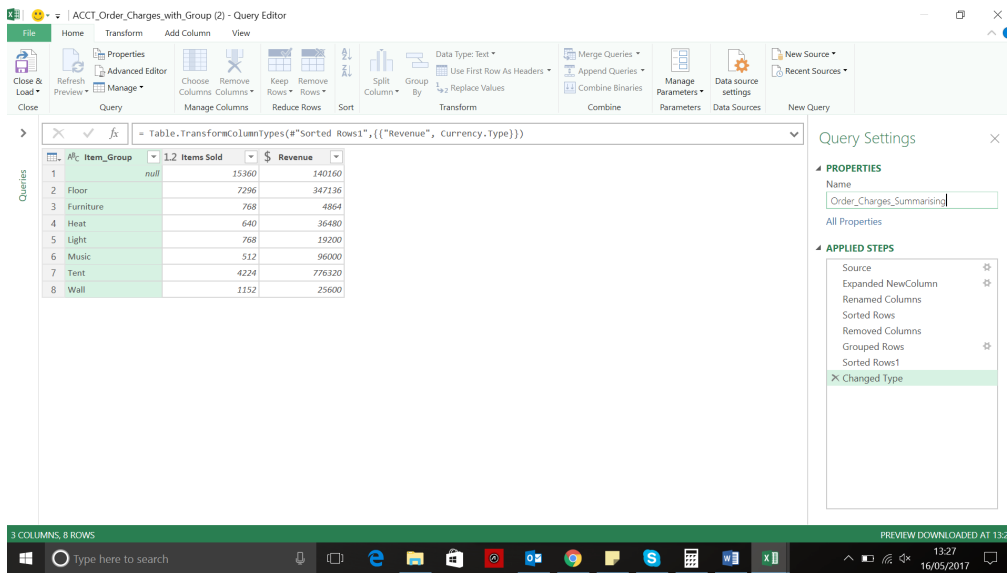
Following on from last month, despite having simplified my data into groupings, we can still access data that makes up the group to provide more information. At the end of last month's Power Query Pointer, we had made some changes to a query of mine, 'ACCT_Order_Charges_with_Group'. We will be making more changes, but to avoid causing problems to the grouping query, let's create a copy of the query. Here, the example has already taken the grouping step further to show which item group is the best seller:



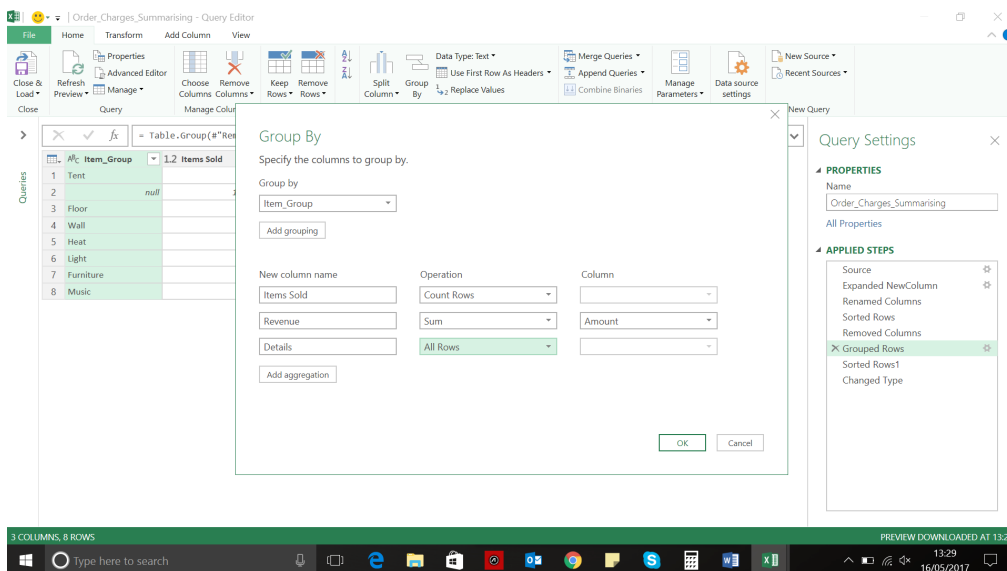
The easiest way to make a copy of the query is in the Excel workbook. The 'Workbook Queries' pane should be displayed (if it's not, use the 'Show Pane' option on the 'POWER QUERY' tab, or in the 'Get and Transform' section). Right clicking my query gives me the option to 'Duplicate' it.



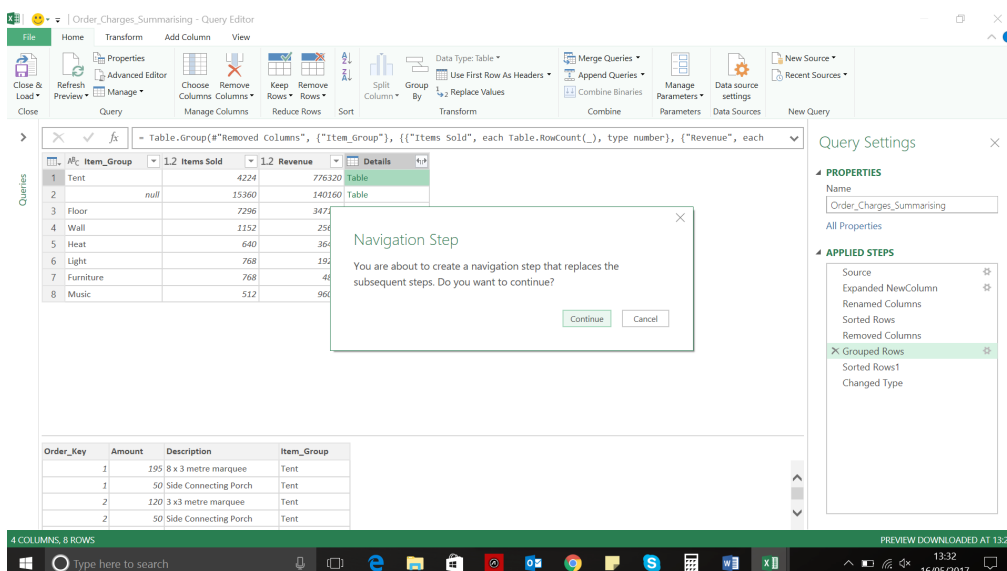
Next, we will duplicate the query, and give it a new name 'Order_Charges_Summarising':



Now, suppose we were at this stage and we needed to find out the most expensive selling item in each item group. We would need to see the data behind the grouping, and to do this we would need to modify the grouping step. Therefore, click on the gear icon next to the 'Grouped Rows' step and add a column ('aggregation') 'Details' which will act on all rows:

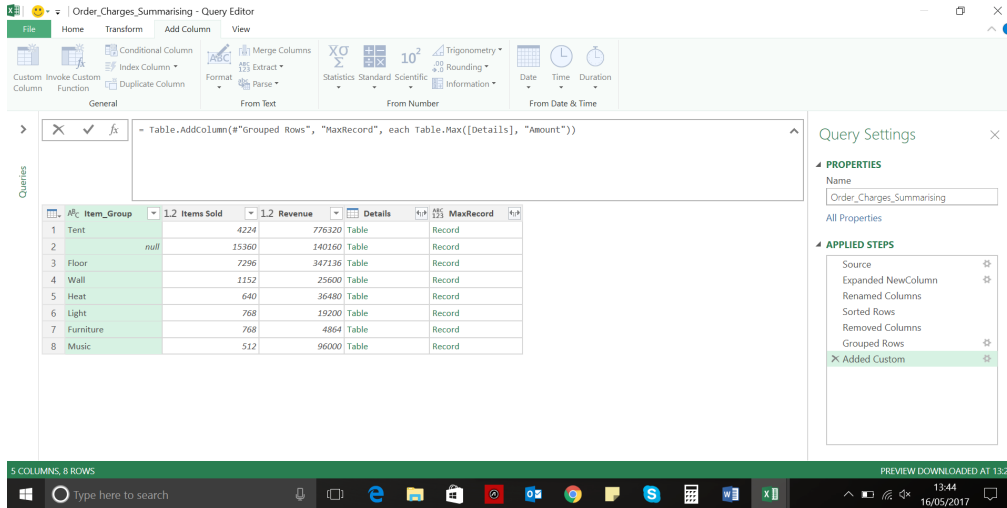


Clicking 'OK' gives us a new column, which contains tables. Clicking on the word 'Table' has two effects. Firstly, we get a warning because other steps exist after my 'Grouped Rows' step and secondly, we see the contents of our table viz.

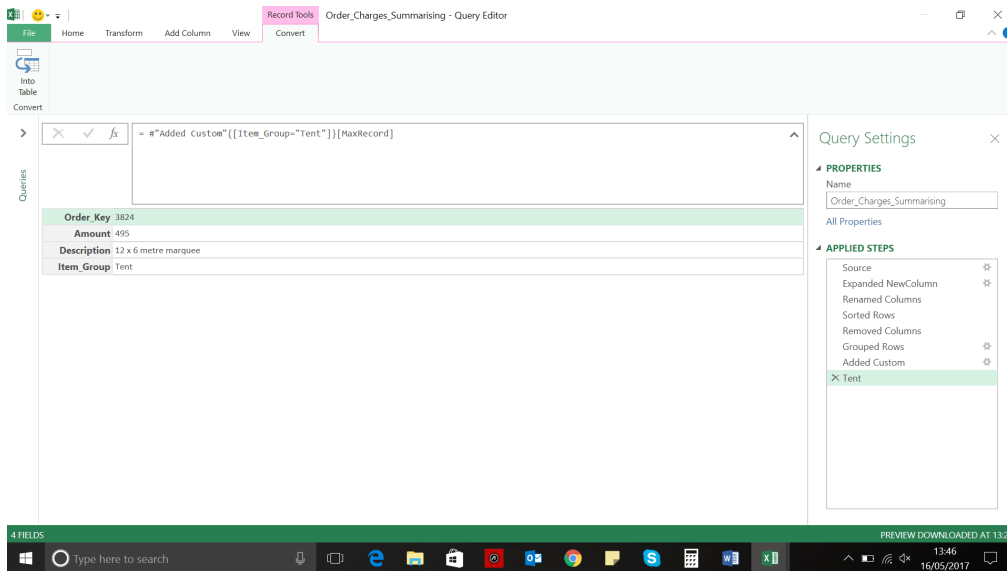


The warning reminds us to remove the last two steps, which we can do since they were only introduced to tidy up the grouped data. Having removed them, we need to find a way to get at the data in the tables so that we can work out which item was the most expensive selling item in each item group. We are going to need a custom column, using a record. The formula we will use is

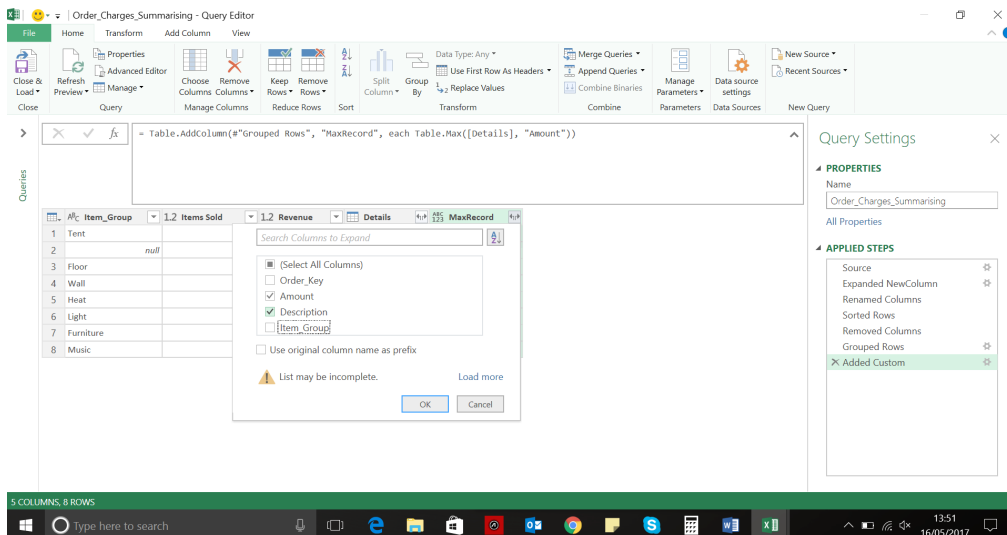
= Table.Max([Details], "Amount")



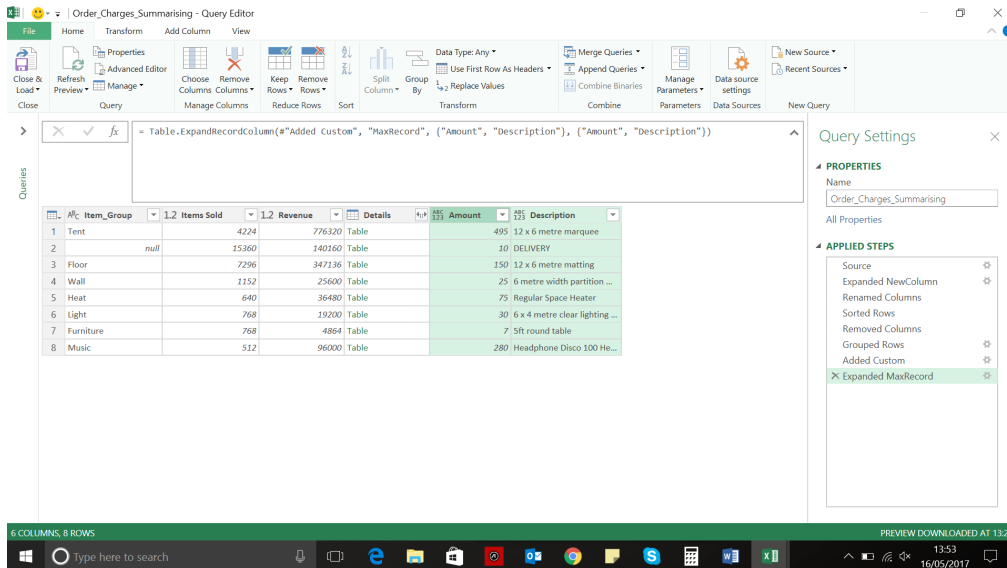
Clicking on any record will show us what is in it (and creates a step):



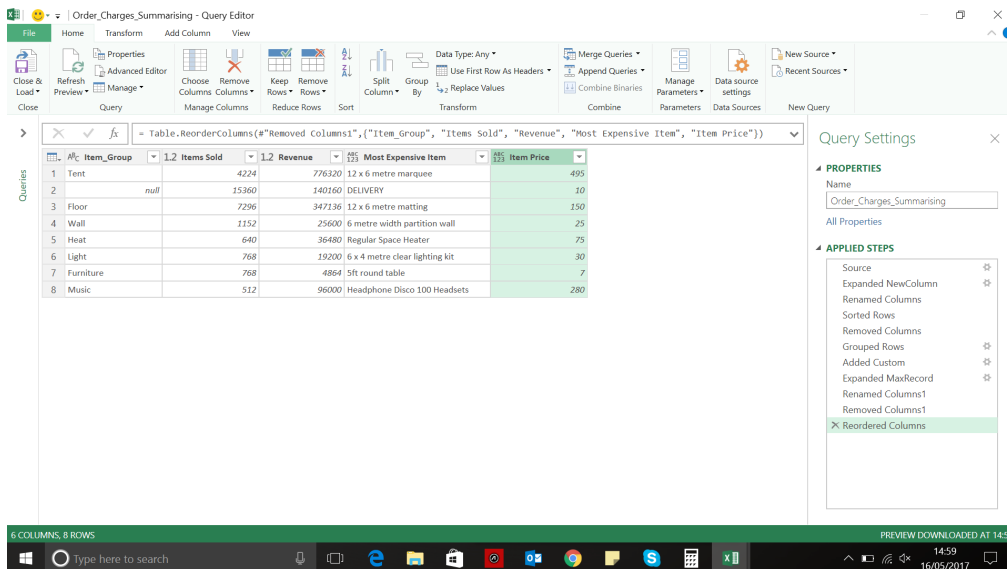
Since we have chosen to use a record, what is shown is not just the most expensive item in the group, but also the other data associated with that item, in effect a row within a row. Let's delete the last step and go back to the 'Added Custom' step. Then, choose to use the expand icon next to the **MaxRecord** column name to expand all of the records:



We only want the 'Amount' and 'Description' and we'll keep the column names for now.



What we have now is the description of the most expensive item in each group, and the price for that item, so let's change the names accordingly, remove the **Details** column and reorder ready to load.



This is a simple example of getting data from records when the data has been grouped.

More next month!

September Updates for Power BI Desktop

The pace of change continues, but the volume may be decreasing slightly. No matter: this month's updates include Previews of aggregations and a PDF file connector, which are both likely to prove popular.

The September updates are as follows:

Reporting

- Dot plot layout support in scatter charts
- Copy value and selection from table and matrix
- Built-in report theme options
- Report page tooltips Generally Available and Card support
- Accessibility improvements for analytics and formatting pane support

Analytics

- Aggregations (Preview)
- Q&A support for RLS

Data Connectivity

- PDF file connector (Preview)
- SAP BW connector: support for measure properties
- Dataflows connector (Beta)

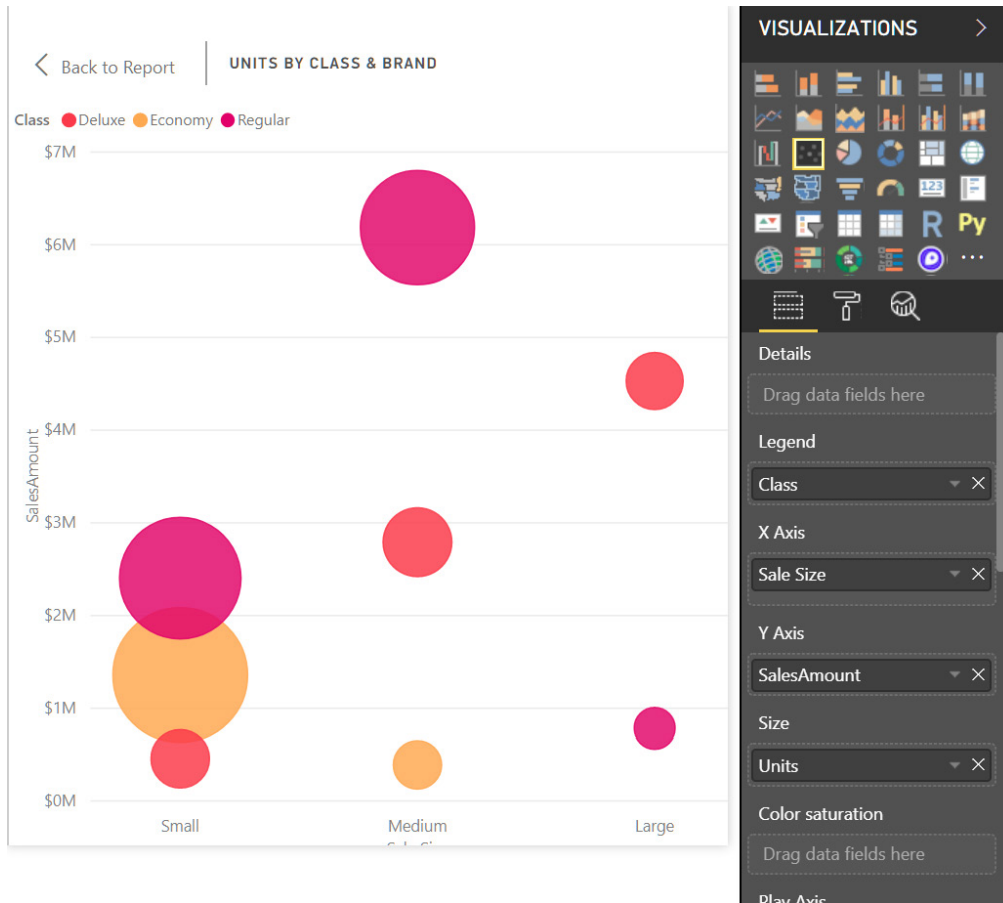
Data Preparation

- M intellisense (Preview)
- Add Column From Examples: support for text padding

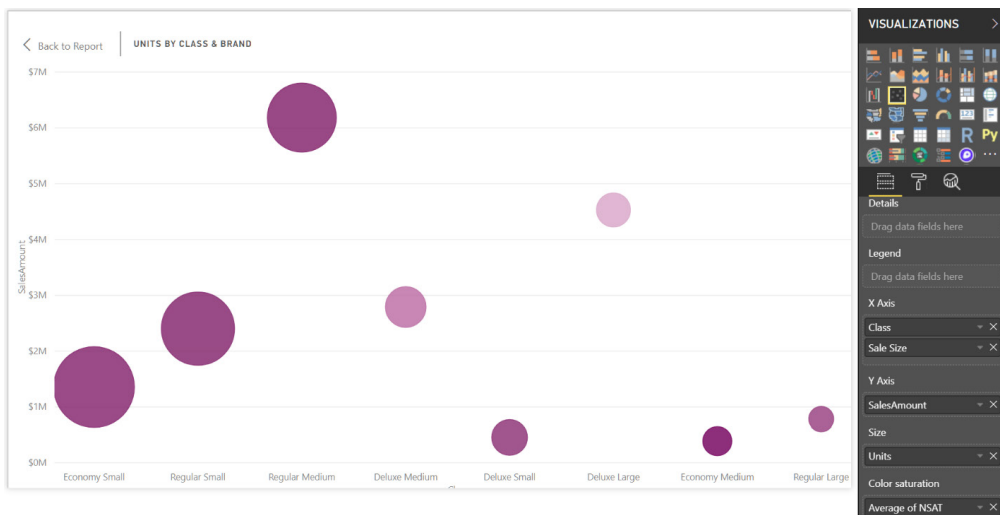
You know the routine by now. Let's go through each new feature in turn.

Dot plot layout support in scatter charts

To start, there's a substantial update to the scatter chart with this update. You can now use categorical fields on the **x-axis** of your scatter chart, allowing you to create dot plots. You don't need to do anything special to enable this feature, simply add your categorical field to the **x-axis** and remove anything you may have in the detail's bucket.



You can do this in combination with all of the formatting features and it works with drilling on the **x-axis** too.



Copy value and selection from table and matrix

It's no secret that many users need to copy data out of Power BI into other applications like Dynamics CRM, Excel and even other Power BI reports. Microsoft's first feature related to this is the ability to copy a specific value or a selection of data from a table or matrix. You'll be able to find both of these options on the right-click menu.

'Copy value' will add the unformatted value to your clipboard, and from there you can paste it wherever you want. For example, 'copy value' from this cell in the table (below) will add **32,130** to the clipboard.

SalesAmount	ProductName
\$32.1K	SV USB Data Cable E60
\$31.8K	SB Data Cable E60
\$26.5K	SB Data Cable E60
\$25.6K	re 80mm Dual Ball
\$23.2K	SV H
\$23.2K	SV H

'Copy selection', on the other hand, will add a tabular version of all data currently selected in your table or matrix to the clipboard, including the row and column headers. The data will retain the data formatting that has been applied and subtotals will be excluded. This option is very

useful if you want to reuse a selection of data in another report in Excel for some quick calculations.

For example, if you have the entire 'Economy' column selected in the matrix (below) and pick 'Copy selection':

Year	Deluxe	Economy	Regular	Total
2015	\$290.8K	\$117.3K	\$601.4K	\$1,009.5K
Qtr 4	\$128.3K	\$44.4K	\$228.1K	\$400.8K
Qtr 3	\$67.7K	\$28.4K	\$153.5K	\$249.6K
Qtr 1	\$56.3K	\$26.1K	\$126.6K	\$208.9K
Qtr 2	\$38.4K	\$18.2K	\$75.7K	\$132.3K
2014	\$370.5K	\$106.3K	\$1,009.5K	\$1,486.3K
Qtr 4	\$178.1K	\$47.9K	\$582.3K	\$808.3K
Qtr 3	\$82.3K	\$20.5K	\$150.9K	\$253.7K
Qtr 1	\$73.9K	\$22.7K	\$74.8K	\$171.4K
Qtr 2	\$36.1K	\$14.9K	\$66.2K	\$117.2K
2013	\$94.7K	\$27.4K	\$115.4K	\$237.5K
Qtr 4	\$68.9K	\$12.2K	\$46.0K	\$127.1K
Qtr 3	\$24.2K	\$3.1K	\$35.6K	\$62.9K
Qtr 2	\$7.5K	\$17.0K	\$24.4K	\$48.9K
Qtr 1	\$1.6K	\$4.7K	\$16.8K	\$23.0K
2012	\$29.6K	\$7.9K	\$42.8K	\$80.3K
Qtr 3	\$19.5K	\$2.1K	\$8.2K	\$29.8K
Qtr 4	\$9.0K	\$3.9K	\$15.9K	\$28.8K
Qtr 1	\$1.5K	\$12.6K	\$14.1K	\$28.2K
Qtr 2	\$1.2K	\$0.4K	\$6.0K	\$7.6K
2011	\$0.0K	\$1.1K	\$1.1K	\$2.2K
Qtr 4	\$0.0K	\$1.1K	\$1.1K	\$2.2K
Total	\$785.6K	\$258.7K	\$1,254.4K	\$2,298.7K

You will get all of this data in a tabular format when pasting into Excel:

	A	B	C	D
1	Year	Quarter	Class	SalesAmount
2	2015	Qtr 4	Economy	\$44.4K
3	2015	Qtr 3	Economy	\$28.4K
4	2015	Qtr 1	Economy	\$26.1K
5	2015	Qtr 2	Economy	\$18.6K
6	2014	Qtr 4	Economy	\$47.9K
7	2014	Qtr 3	Economy	\$20.5K
8	2014	Qtr 1	Economy	\$22.7K
9	2014	Qtr 2	Economy	\$14.9K
10	2013	Qtr 4	Economy	\$12.2K
11	2013	Qtr 3	Economy	\$3.1K
12	2013	Qtr 2	Economy	\$7.5K
13	2013	Qtr 1	Economy	\$4.7K
14	2012	Qtr 3	Economy	\$2.1K
15	2012	Qtr 4	Economy	\$3.9K
16	2012	Qtr 1	Economy	\$1.5K
17	2012	Qtr 2	Economy	\$0.4K
18	2011	Qtr 4	Economy	\$0.0K

Who needs Power Query?

Note that when you have multiple measures in your matrix, they are always selected together, so you'll always get both when copying selection. For example, copying the below selection

Class	Deluxe		Economy		Regular		Total	
	SalesAmount	Units	SalesAmount	Units	SalesAmount	Units	SalesAmount	Units
2015	\$290.8K	373	\$117.3K	1020	\$601.4K	1395	\$1,009.5K	2788
Qtr 4	\$128.3K	153	\$44.4K	343	\$228.1K	473	\$400.8K	969
Qtr 3	\$67.7K	91	\$28.4K	313	\$153.5K	375	\$249.6K	779
Qtr 1	\$56.3K	81	\$26.1K	226	\$126.6K	328	\$208.9K	635
Qtr 2	\$38.4K	48	\$18.6K	138	\$93.2K	219	\$150.2K	405
2014	\$370.5K	378	\$106.0K	913	\$493.8K	1348	\$970.3K	2639
Qtr 4	\$178.1K	158	\$47.9K	391	\$202.0K	550	\$428.0K	1099
Qtr 3	\$82.3K	97	\$20.5K	255	\$150.9K	392	\$253.7K	744
Qtr 1	\$73.9K	82	\$22.7K	159	\$74.9K	243	\$171.3K	454
Qtr 2	\$36.1K	41	\$14.9K	10	\$74.9K	243	\$117.2K	342
2013	\$94.7K	78	\$27.4K	28	\$74.9K	243	\$237.5K	738
Qtr 4	\$68.9K	54	\$12.2K	15	\$74.9K	243	\$127.1K	355
Qtr 3	\$24.2K	19	\$3.1K	4	\$74.9K	243		
Qtr 2			\$7.5K	56	\$17.0K	59		
Qtr 1	\$1.6K	5	\$4.7K	36	\$16.8K	60		

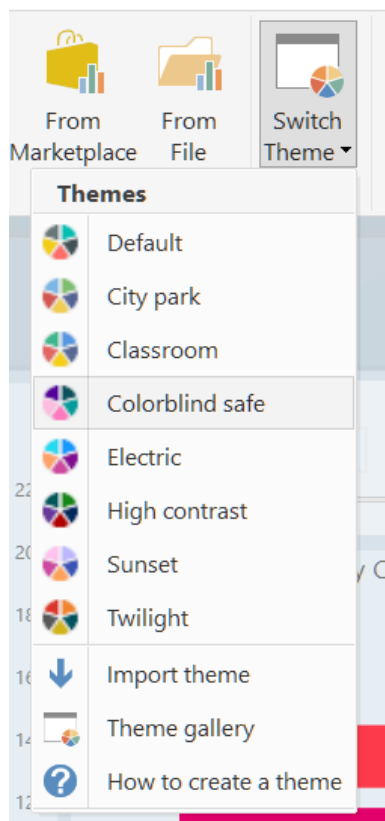
will add the following to your clipboard:

Year	Quarter	Class	SalesAmount	Units
2015	Qtr 1	Deluxe	\$56.3K	81
2014	Qtr 1	Economy	\$22.7K	159

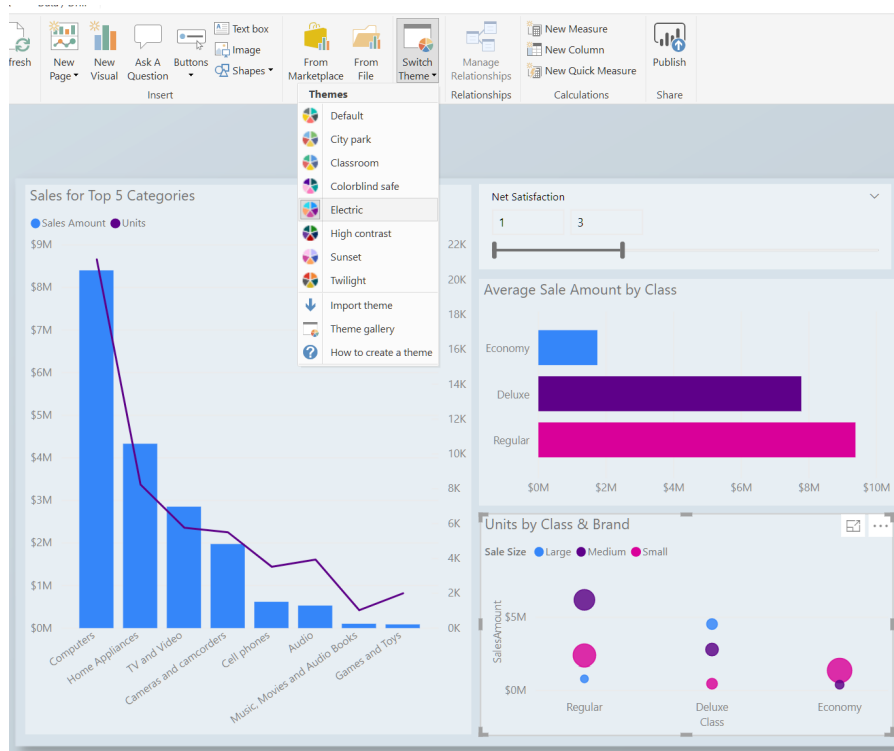
Microsoft has actually advised they have more planned for copying in future releases as well, including the ability to copy all loaded data to the clipboard in its pivoted layout, copying data out of other visuals, and copy visuals between .pbix files. Looking good.

Built-in report theme options

Next up is a themes gallery in the Desktop that allows you to pick between several built-in report themes. You'll be able to see these new theme options under the 'Switch Theme' button in the 'Home' Ribbon tab. In addition to the default theme, you can now pick between seven new options:

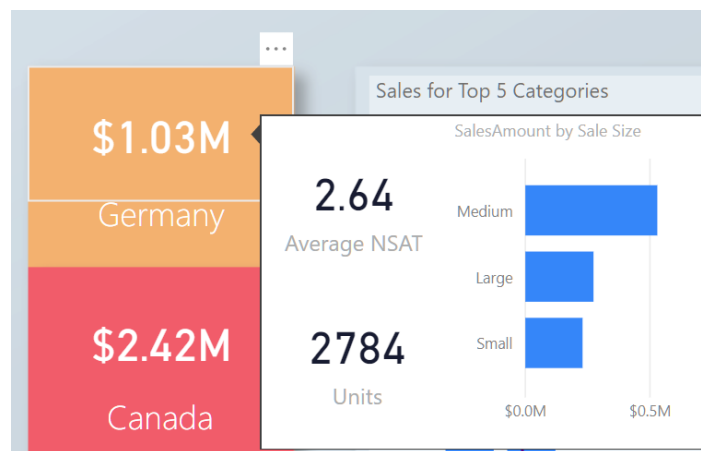


All you need to do is pick the theme of your choice and it will automatically apply its color (sic) palette to all of your visuals using the default color palette. There is now also a quick link to the theme gallery in the community site if you want to try out a theme built by others.



Report page tooltips Generally Available and Card support

This update sees report page tooltips become Generally Available. This means you'll be able to use the feature without needing to enable it in the 'Options' dialog. To go along with making it Generally Available, Microsoft is also adding support for report page tooltips on the Card visual.



Accessibility improvements for analytics and formatting pane support

In this update, as part of enhancing assistive technology, Microsoft has added keyboard and screen reader support for the 'Formatting' and 'Analytics' panes. If your focus is in the 'Formatting' pane or 'Analytics' pane, you'll be able to **TAB** and **SHIFT + TAB** between all the controls, hear useful information read out by a screen reader for any given control, and change the settings using arrow keys and **SPACE / ENTER** depending upon the control type. There will be further support added

to the other areas of the pane, including the 'Field' well and 'Filter' pane in the coming months as well.

Just like any other accessibility improvement, this update improves the experience for all users as well. Many power users will find the keyboard navigation will allow them to work a bit faster when making many changes to a visual's formatting all at once.

Aggregations (Preview)

Aggregations are a way to store only summarised values in memory, to provide the fastest access to aggregated data without having to load your entire dataset into Power BI. We have to be honest, this has been a problem in consulting projects we have encountered so far.

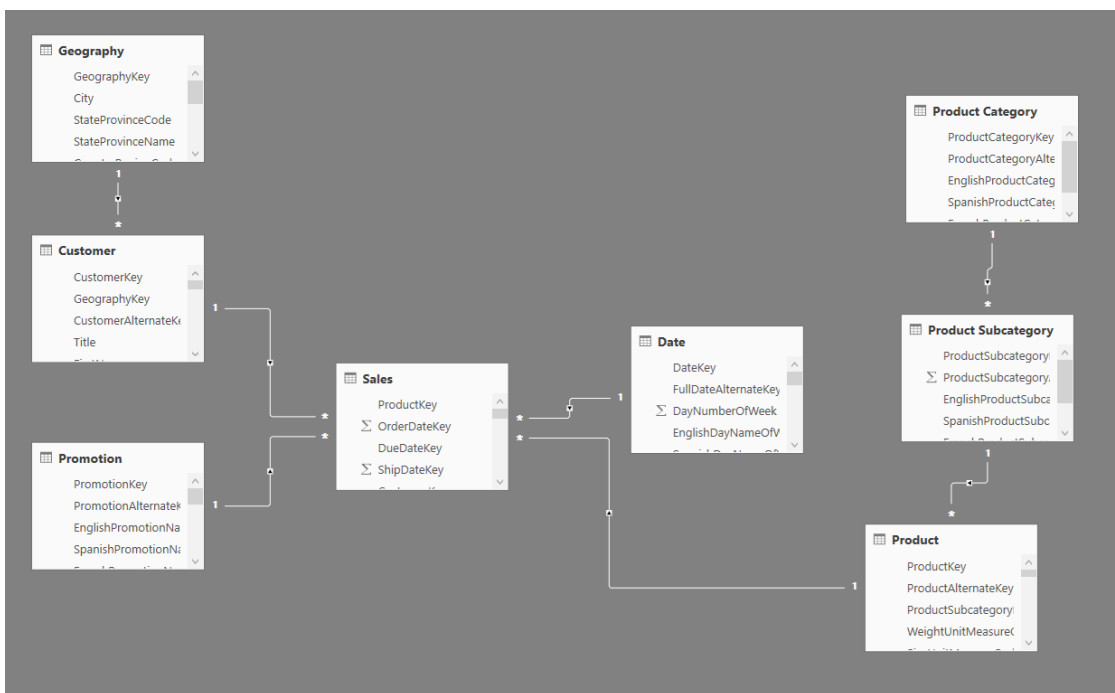
For example, a trillion rows from a Hadoop store might take up ¼ petabyte, but caching the values aggregated up to a daily level might reduce that to

a few gigabytes which can be cached in memory much more easily. The magic is that this is seamless to the report users – as they slice further down to the detail level, if Power BI doesn't have the answer in memory it automatically passes the query down to the underlying source using DirectQuery. Using aggregations can dramatically reduce the cost of unlocking large datasets for decision making in enterprise organisations.

Some benefits of aggregations include:

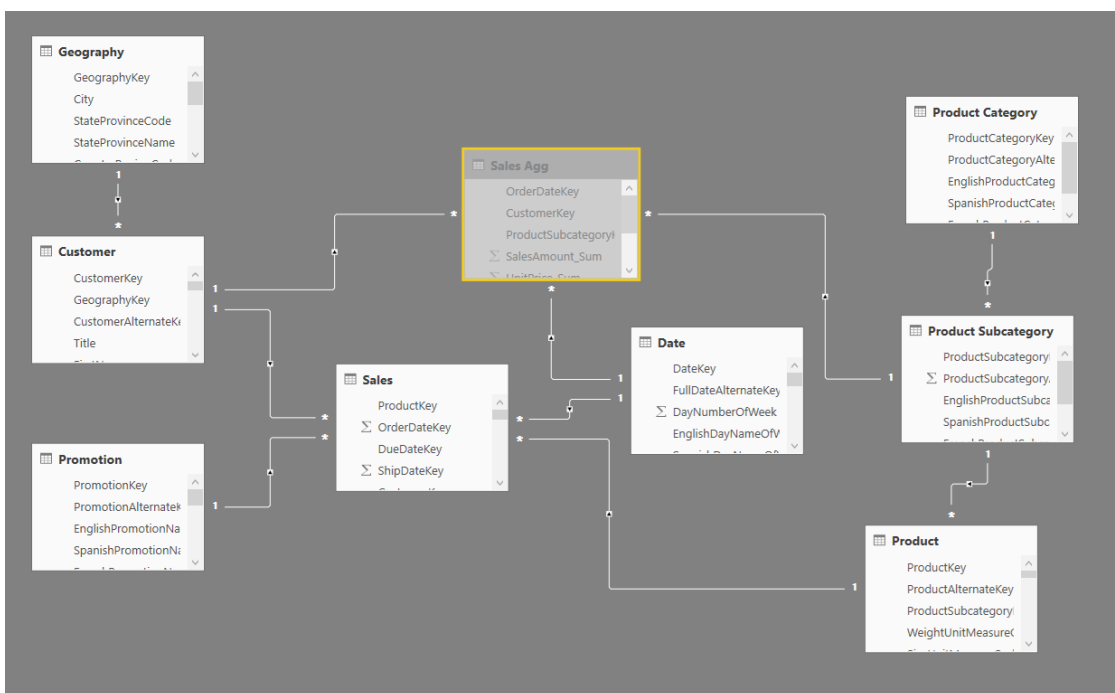
- **Query performance over large datasets.** As you interact with visuals on Power BI reports, DAX queries are submitted to the dataset. This will boost query speeds by caching data at the aggregated level using a tiny fraction of the resources that would be required at the detail level. This will mean users may unlock big data in a way that would not otherwise be possible
- **Data refresh optimisation.** You will be able to reduce cache sizes and refresh times by caching data at the aggregated level. This will reduce the time required to make data available for users
- **Achieve balanced architectures.** This allows the Power BI in-memory cache to handle aggregated queries, which it is generally efficient with. This will limit queries sent to the data source in DirectQuery mode, helping stay within concurrency limits. Queries that do get through tend to be filtered, transactional-level queries, which data warehouses and big-data systems normally handle these well.

Here's an example to show how aggregations are set up. Let's say we have a model where all the tables are DirectQuery. The Sales fact table contains billions of rows. Setting the storage mode of Sales to 'Import for caching' would consume considerable memory and management overhead.

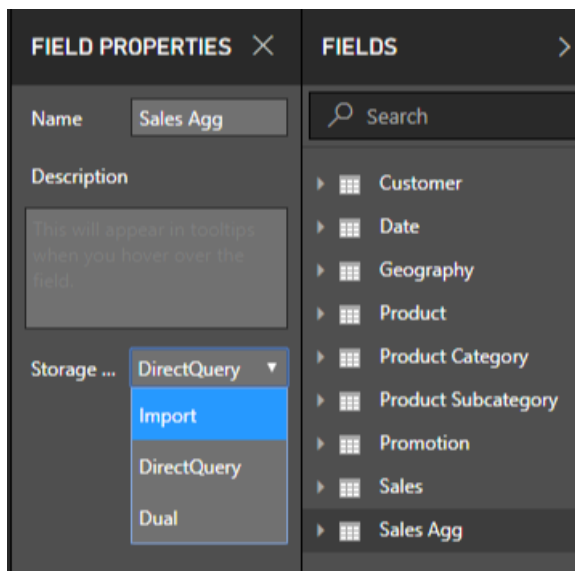


Instead, we create the **'Sales Agg'** table which will become our aggregation table. It is at a higher grain than the **'Sales'** table, so it will contain far fewer rows. The number of rows should equal the sum of **SalesAmount** grouped by **Customer**, **Date** and **Product Subcategory** keys. Instead of billions, this might be millions of rows, which will be much easier to manage.

The dimension tables most commonly used for the queries with high business value are set up so the tables that can filter **'Sales Agg'** using one-to-many (or many-to-one) relationships. In our case, that includes the **Geography**, **Customer**, **Date**, **Product Subcategory**, and **Product Category** tables. Other relationship types such as many-to-many or multi-source are not used for aggregations.



Now that we have our table set up, we'll set the storage mode of **Sales Agg** to 'Import' to speed up queries.

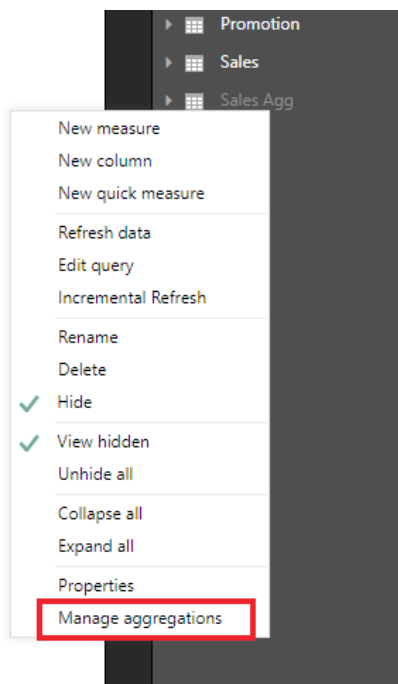


When we do this, we'll be setting the storage mode to 'Dual', since we are mixing DirectQuery and Import sources. Setting the storage model to 'Dual' allows the related dimension tables to act as either Import or DirectQuery depending upon the subquery.

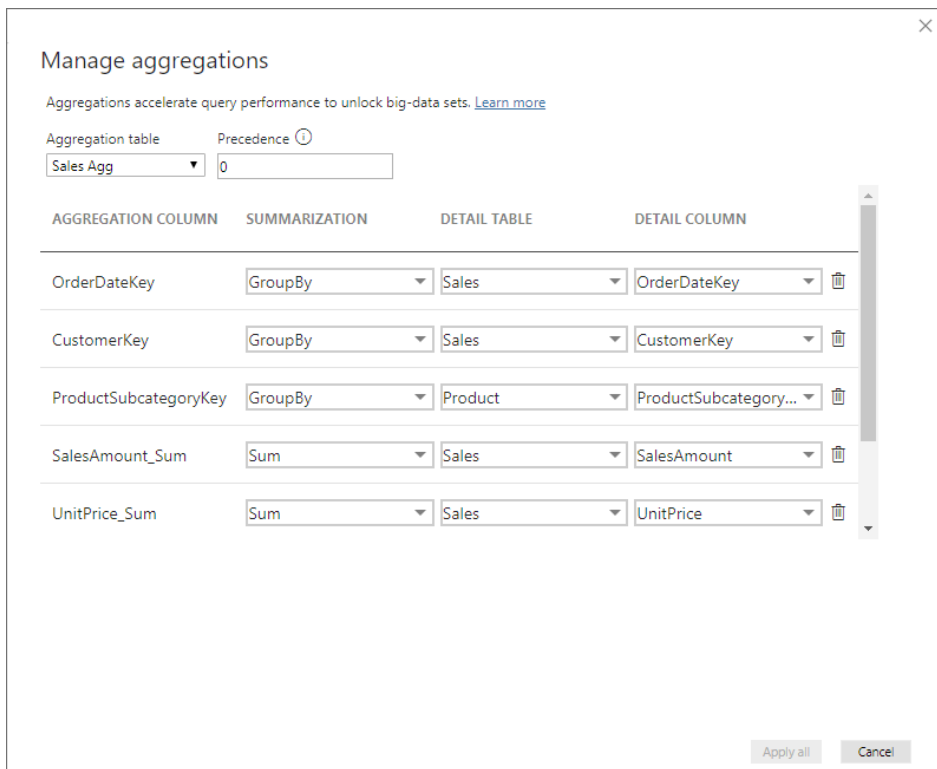
Queries that aggregate metrics from the **Sales Agg** table, which is Import, and group by attribute(s) from the related 'Dual' tables will be returned from the in-memory cache. However, queries that aggregate

metrics in the **Sales** table, which is DirectQuery, and group by attribute(s) from the related 'Dual' tables will be returned in DirectQuery mode. The query logic including the group by operation will be passed down to the source database.

Next, we define the aggregations by selecting the manage aggregations context menu for the **Sales Agg** table.



The 'Manage aggregations' dialog shows a row for each column in the **Sales Agg** table, where you can specify the aggregation behaviour.



After this, queries submitted to the Power BI dataset that refer to the **Sales** table are internally redirected to the **Sales Agg** table. This means you can hide the **Sales Agg** table and other users of the dataset don't need know the **Sales Agg** table even exists!

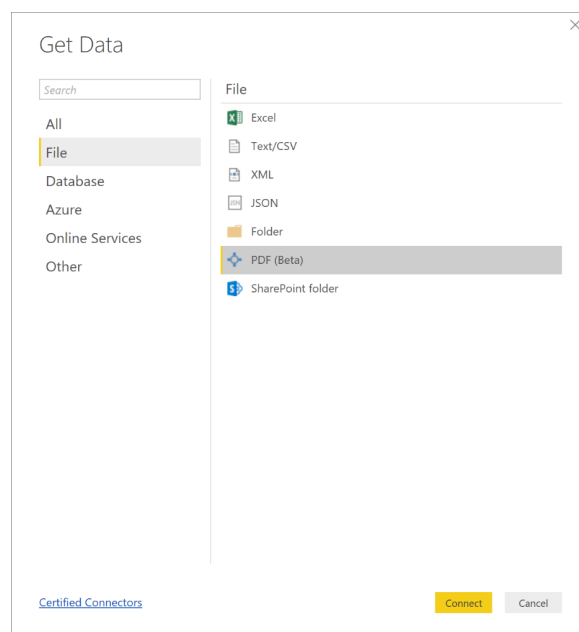
Q&A support for RLS

You can finally use Q&A and Row Level Security, which lets you configure your datasets and reports to only show rows of data that the current user should have access to, on the same dataset. This means that your users will be able to ask natural language question over these datasets, and they will only see results and suggestions that the RLS rules allow

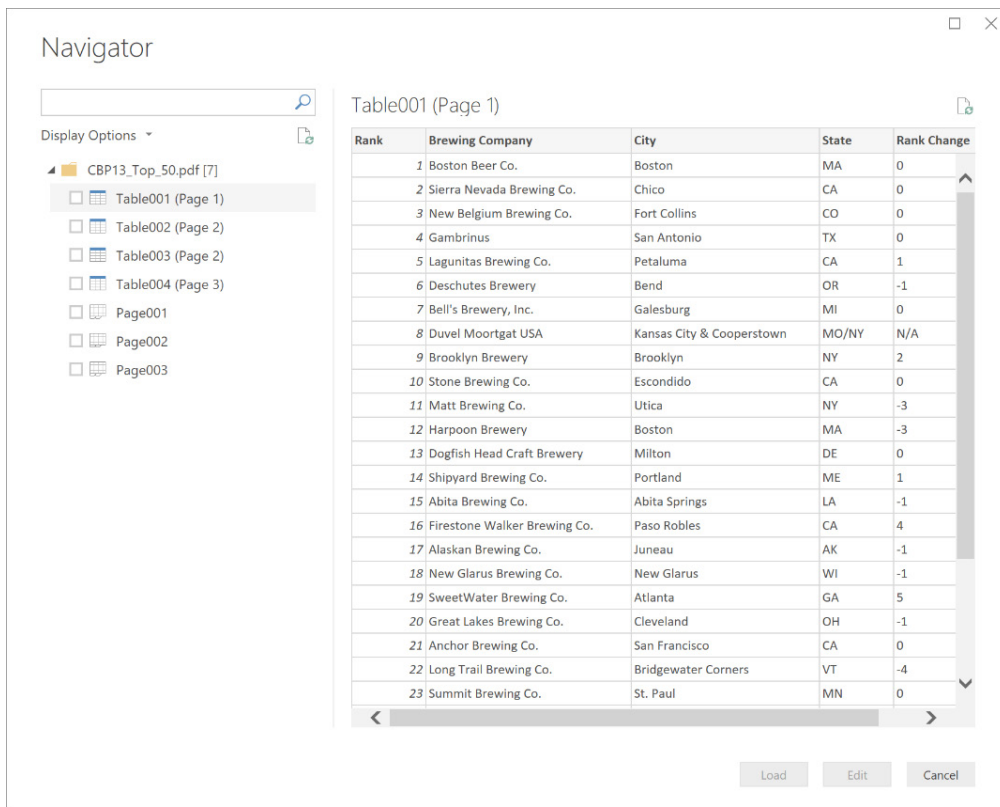
them to see. You can start testing it out now in Power BI Desktop using the 'View as Role' experience while using the Q&A explorer dialog or Q&A for report creation. It's rolling out to the Power BI service as we write...

PDF file connector (Preview)

This release sees a Preview of the PDF Connector. Not before time!! In order to try it out, you will need to enable it under the 'Preview features' list in the 'Options' dialog. After enabling this Preview feature and restarting Power BI Desktop, the PDF File connector will appear under the 'File' category in the 'Get Data' dialog:



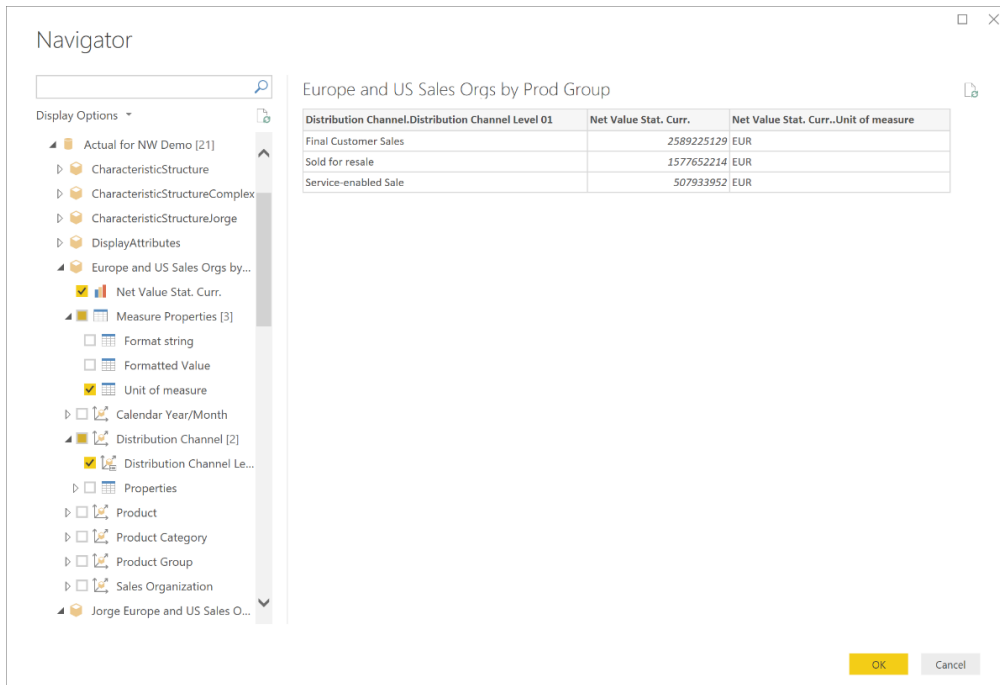
After selecting this connector, you will be prompted to specify a path to a PDF file. Once the file is specified, Power Query will extract tables automatically and present them to you in the Navigator dialog, where you can preview and select one or multiple tables.



Looking forward to this one!

SAP BW connector: support for measure properties

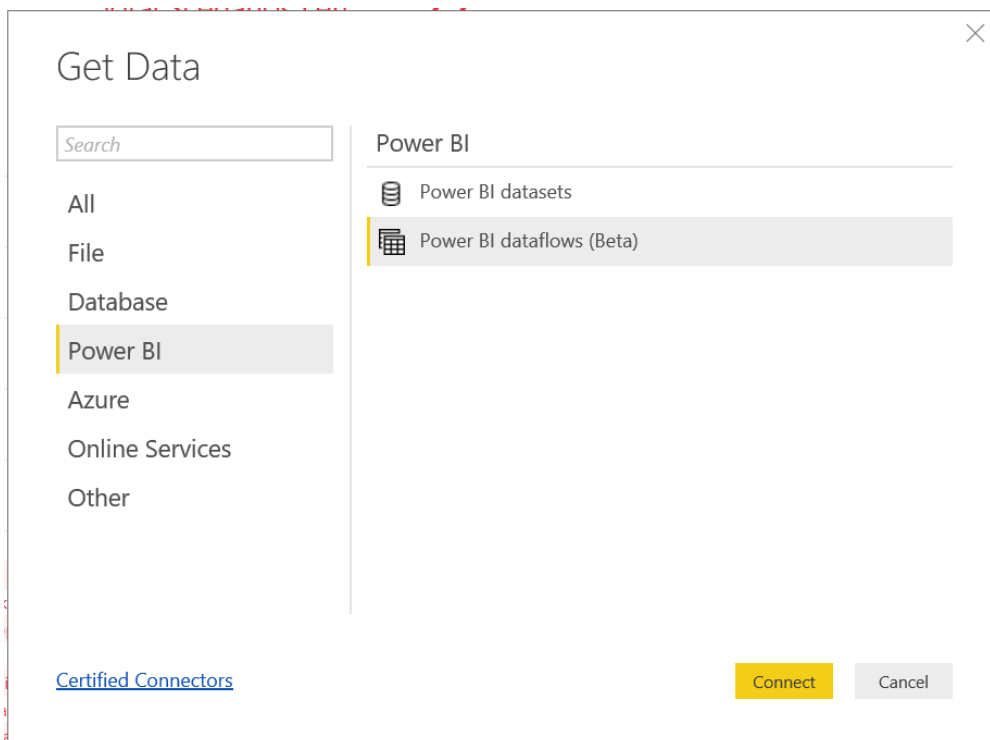
A new capability added this month to the SAP BW Connector allows you to select additional measure properties when using the SAP BW connector in 'Import' mode. Within the 'Navigator' dialog, you can now select one or multiple measure properties:



In the future, Microsoft plans to add this capability to SAP BW DirectQuery mode as well.

Dataflows connector (Beta)

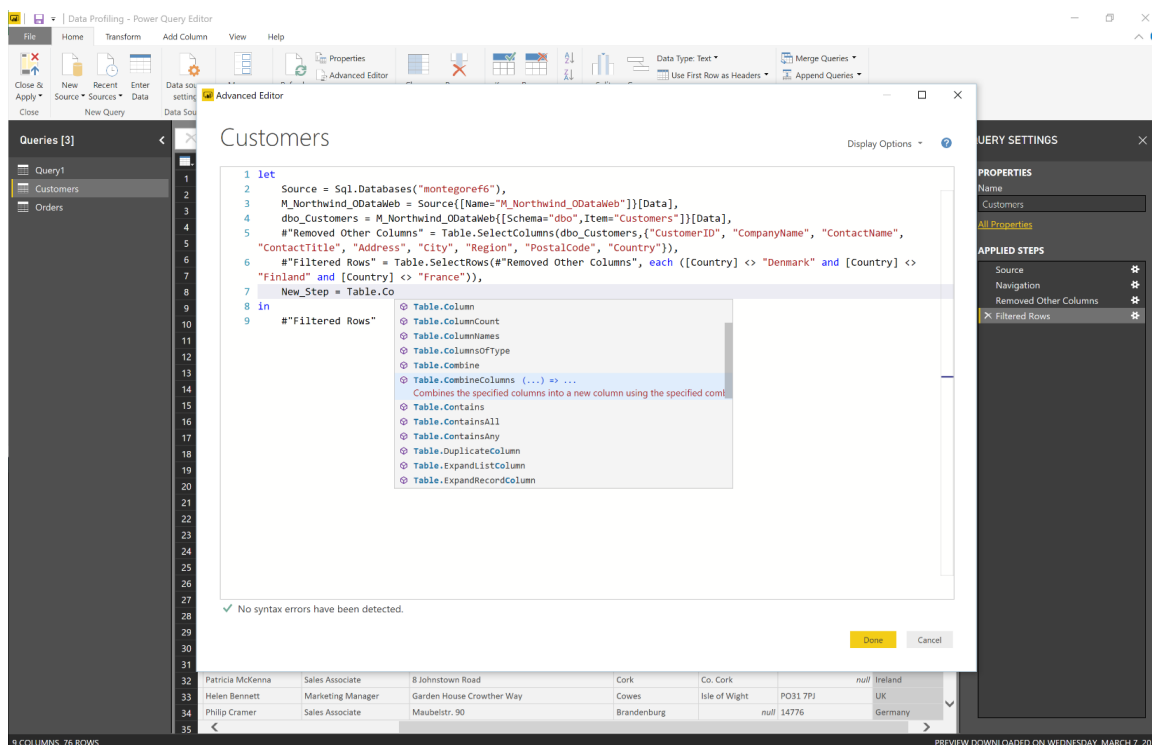
Dataflows are a powerful new addition to Power BI. With dataflows, users can connect to multiple data sources and prepare their data for use in Power BI. Dataflows are an integrated part of the Power BI suite; the dataflows desktop connector is now a part of Power BI Desktop allowing you to seamlessly connect to data carpeted by dataflows.



M intellisense (Preview)

With this release, Power BI Desktop includes a Preview of Intellisense support for the **M** language. This support is available in the 'Advanced Query Editor' in this release. In the future, Microsoft plans to add **M** Intellisense support for the Formula Bar and the 'Custom Column' dialog. To try out this new feature, you need to enable it under the 'Preview features' tab in the 'Options' dialog.

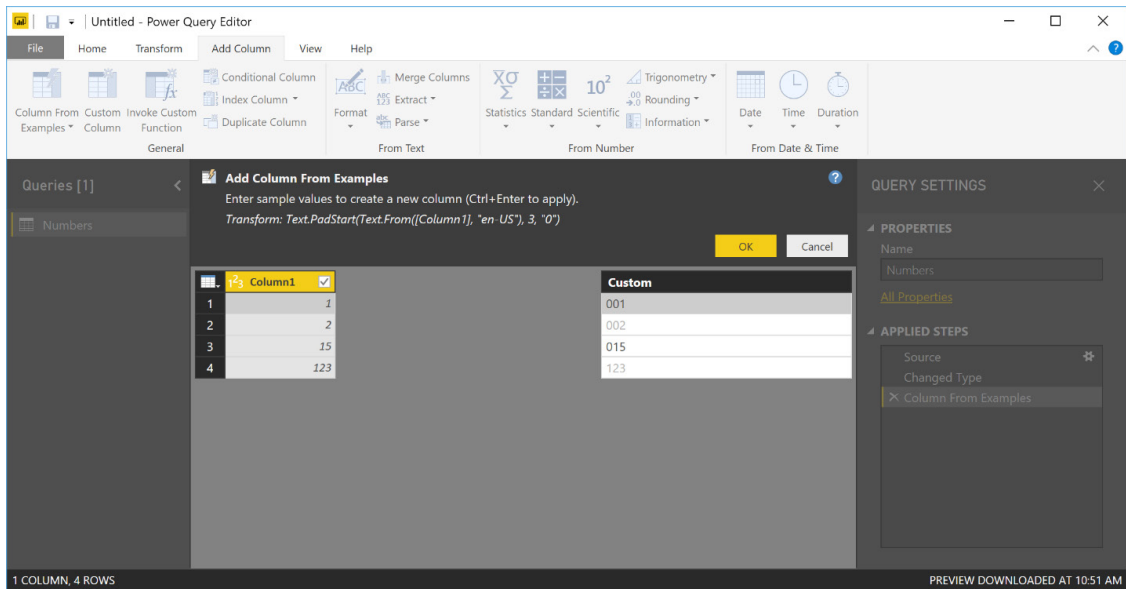
After the feature has been enabled and Power BI Desktop is restarted, you can leverage Intellisense within the 'Advanced Editor' in the 'Power Query Editor' dialog. This includes syntax colouring, line numbers, function completions and parameter metadata for **M** library functions.



Add Column From Examples: support for text padding

This update improves 'Add Column From Examples' by adding support for Text Padding transformations, which can now be composed with any other transformations in order to generate the right set of transformations to go from input columns to desired output based on

user-provided samples. Text Padding allows you to make values within a Text column conform to a fixed width by adding characters at the beginning or the end of the original value.



More updates and intel next month we're sure!

Latest Updates for Power BI Service and Mobile

The new stuff keeps coming. We're feeling a little lazy this month so no categorisations:

- Multi-geo support for Power BI Premium (Preview)
- APIs and PowerShell Cmdlets
- Persistent filters on custom visuals
- New workspaces experience (Preview)
- Custom visuals API v1.1 and older deprecation
- Power BI Report URL filter improvements
- On-premises data gateway update
- Power BI Premium Capacity Monitoring (Preview)
- Single Sign-On in Power BI Mobile Windows App
- Phone report layout editing in Power BI Service
- Phone drill through now available for Table and Matrix visuals.

We'll go through each in turn.

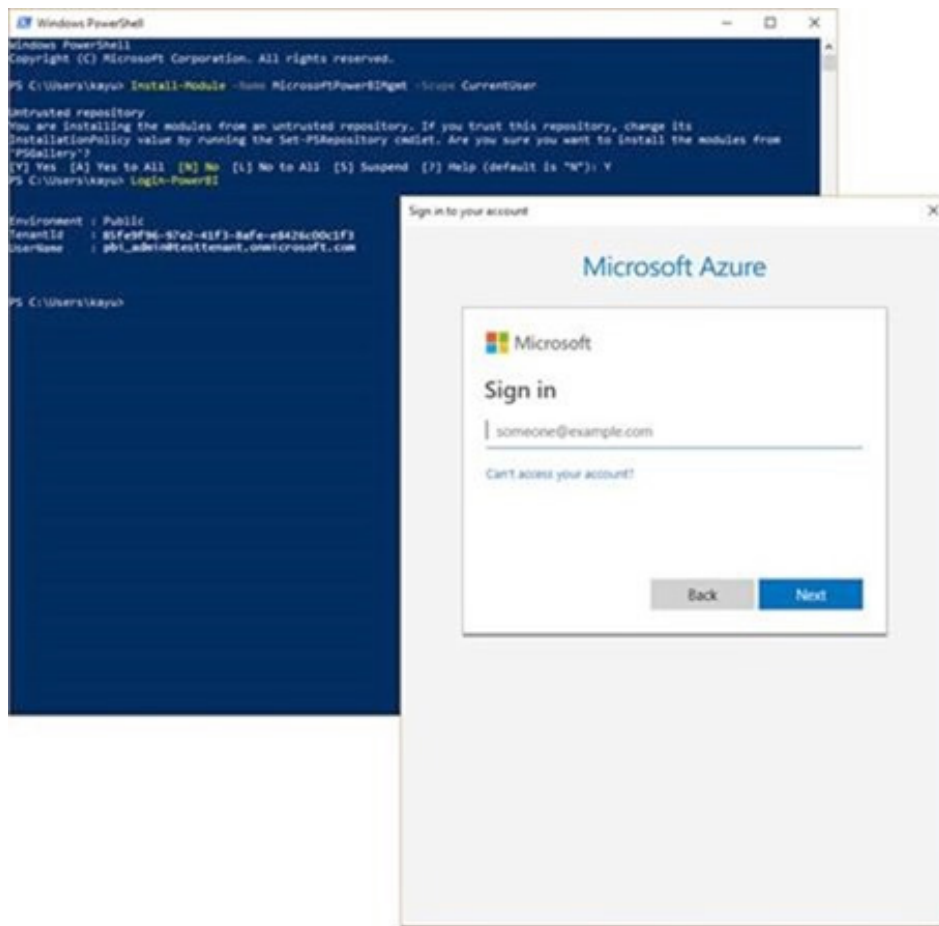
Multi-geo support for Power BI Premium (Preview)

Back in the August newsletter, we mentioned the public Preview of Multi-Geo for Power BI Premium, which Microsoft viewed as their "next step" in helping multinational organisations address their data residency requirements. This is important as organisations / businesses are extremely wary of where their data is located based upon legal regulations and commitments made to their own customers.

With Multi-Geo, Power BI administrators can deploy a Premium capacity to one of nine geographical ("geo") locations available globally. For this current Preview, users' Power BI datasets and cached queries are stored in the region selected for their capacity. Additional metadata, such as dataset credentials and Excel workbooks, will still be stored in the geo associated with the Power BI tenant. Microsoft plans to migrate this into Multi-Geo capacities soon.

APIs and PowerShell Cmdlets

Microsoft has just released a new set of Admin APIs, along with a .NET SDK and a PowerShell module, to help IT administrators effectively govern their Power BI deployment. These new capabilities go beyond what is currently available in the Power BI Admin Portal and give administrators visibility into every aspect of their BI environments.



Persistent filters on custom visuals

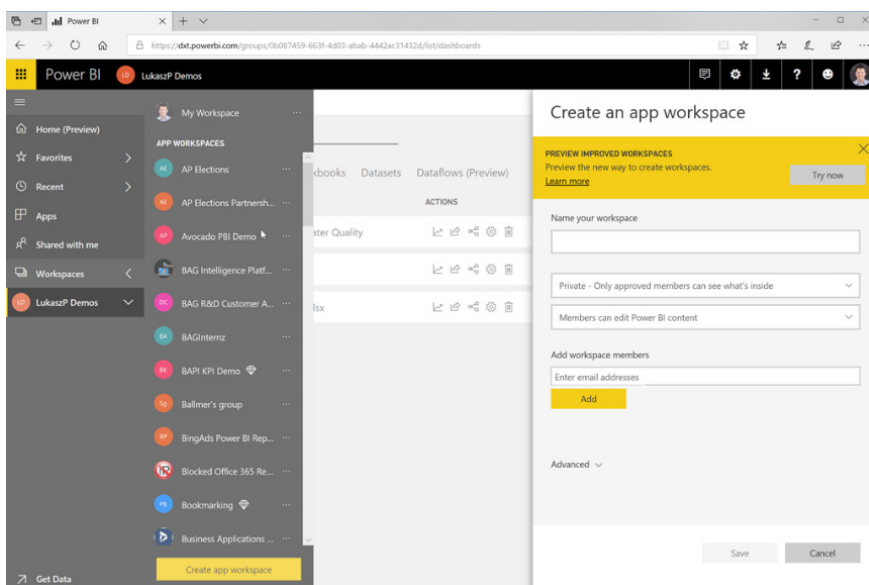
Our April newsletter detailed the introduction of persistent filters. At that time, we noted that this feature was not supported for any reports that contain custom visuals. Microsoft has now partially removed the restriction and officially support the following common custom visuals:

- Chiclet Slicer
- Hierarchy slicer
- Timeline slicer
- Attribute slicer

New workspaces experience (Preview)

App workspaces play a vital role in collaboration and content management of reports, dashboards and datasets in Power BI. Since its launch in May 2017, Microsoft has been collating feedback on these workspaces. Consequently, a new Preview of the new workspaces

experience has just been issued that makes it easier for organisations to manage access to workspaces through security groups, distribution lists and Office 365 groups.



Custom visuals API v1.1 and older deprecation

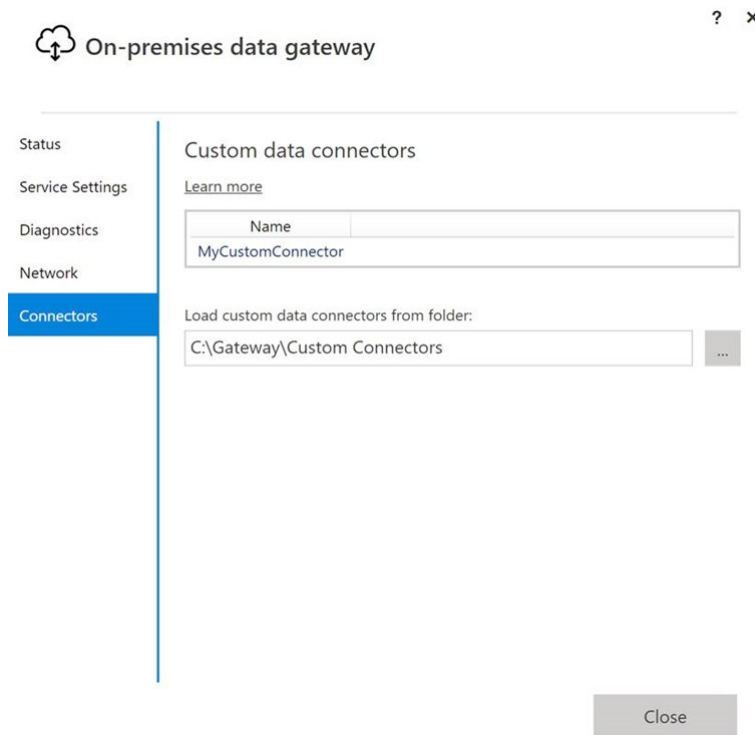
Hopefully all custom visual developers have migrated already, but since September 1, custom visual API versions 1.1 and older have been deprecated. Microsoft will only support API versions 1.2 and above.

Power BI Report URL filter improvements

This update has enhanced the URL filtering capabilities on reports to allow users to define more complex query string parameters. This feature becomes useful when you want to create shortcuts to pre-filtered reports and provide hyperlinks to consumers. URL filters follow the OData syntax and remain consistent to other filtering methods in Power BI. Microsoft plans on bringing more improvements in this area soon.

On-premises data gateway update

The latest release of the On-premises data gateway continues to add improvements on the custom data connectors in the Enterprise gateway that was announced recently.



Power BI Premium Capacity Monitoring (Preview)

A new Preview has been launched of the Premium Capacity Monitoring application. This app gives capacity administrators the ability to monitor the health of premium capacities and identify any issues that might affect

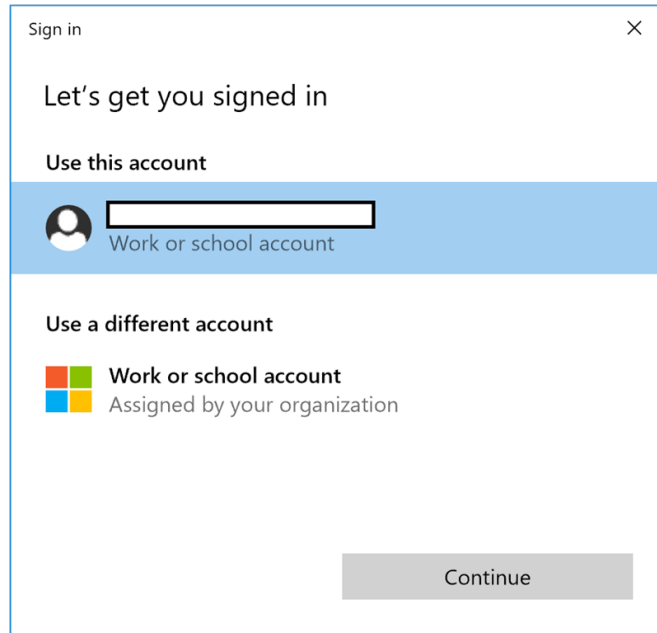
the end users in their deployment. Along with the system metrics, you can see a comprehensive view of dataset refreshes, dataset evictions and queries in the capacity for the past seven days.

Power BI Premium Capacity Management						
System Summary	Capacities	1		Datasets	4478	
	Workspaces	507		Memory evicted	10.4 GB	Memory evicted time: 8/6/2018 1:00:00 PM
	CPU	11.00	CPU number of times hit max: 3	CPU evicted time	8/6/2018 6:00:00 PM	
	Direct Query/Line	0.00	Direct Query/Line number of times hit max: 0	Direct Query/Line evicted time	7/20/2018 9:00:00 PM	
Dataset Summary	Refreshes					
	1678 Total Count	1587 Success Count	91 Failure Count	41 OutOfMemory...	9.47 Average Durat...	1.39 Average Wait Time ...
Queries						
320 Total Count	317 Success Count	3 Failure Count	0.06 Average Duration (min)			

Single Sign-On in Power BI Mobile Windows App

Single Sign-On (SSO) gives you access to all the applications and resources that you need to do business by just signing in once using a single user account. Once signed in, you no longer need to authenticate your applications every time. The Power BI Windows app, with its integration to Azure Active Directory, now enables you to use your

primary organisational account to not only sign in to your domain-joined devices, but also to sign into Power BI Service congruently. And before both of our readers write to us, SSO is enabled only for windows devices managed by Windows Azure AD – yes, we know...).



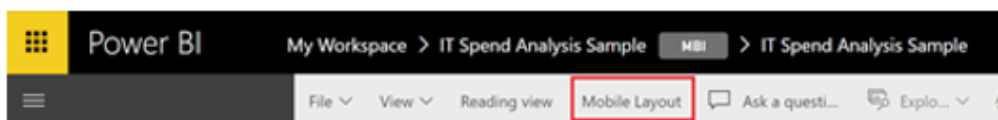
To simplify the sign-in process, when you install the app for the first time, the app will automatically try to authenticate you to Power BI Service using SSO. If this process fails, only then will the app ask you to provide credentials for Power BI.

Existing users that upgrade their app can use SSO by signing out, closing the app and re-opening it on their device. You should notice that when

you are re-opening the app, Power BI will automatically try to use your current windows credentials to authenticate against the service. If you don't want to use your currently Windows active session credentials to sign in to Power BI, just go to setting, sign-out and sign in with different credentials.

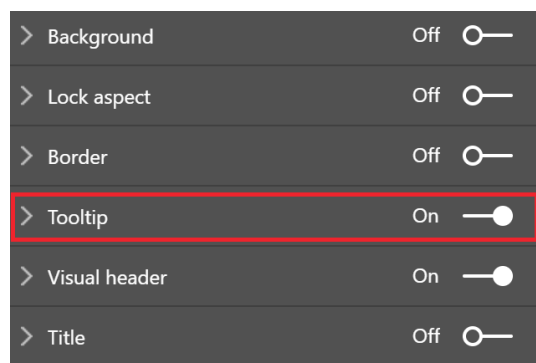
Phone report layout editing in Power BI Service

Microsoft has finally brought the phone report layout editing to the Service. If you already published a report to Power BI Service, you can now create phone report layout directly from the Service. All you need to do is switch to 'Edit' mode and find the 'Mobile Layout' option in the top bar, and your report's phone layout will be in the Service.



Phone drill through now available for Table and Matrix visuals

Finally, for this month, the latest updates allow Table and Matrix visuals to support tooltips, enabling mobile users to get access to the drill actions. You should note that Tooltip is not enabled by default for these visuals, so make sure to turn it on in Power BI Desktop (or Service) to get the drill experience.

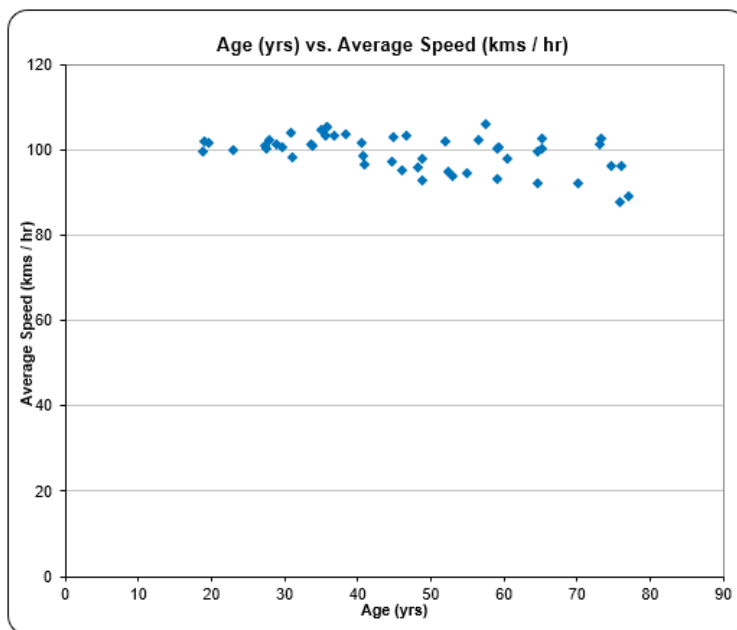


More anon...

The A to Z of Excel Functions: COVAR

So what's the **COVAR** story here? Well, this is all about the measure of the linear relationship between random variables. In probability theory and statistics, covariance is a measure of the joint variability of two random variables. If the greater values of one variable mainly correspond with the greater values of the other variable, and the same holds for the lesser

values, *i.e.* the variables tend to show similar behaviour, the *covariance* is positive. In the opposite case, when the greater values of one variable mainly correspond to the lesser values of the other, *i.e.* the variables tend to show opposite behaviour, the covariance is negative.



The sign of the covariance therefore shows the tendency in the linear relationship between the variables. The magnitude of the covariance is not easy to interpret because it is not normalised and hence depends on the magnitudes of the variables. The normalised version of the covariance, known as the *correlation coefficient*, however, shows by its magnitude the strength of the linear relationship.

This function returns covariance, the average of the products of deviations for each data point pair in two data sets. It is used to determine the relationship between two data sets. For example, you can examine whether greater income accompanies greater levels of education.

The **COVAR** function employs the following syntax to operate:

COVAR(array1, array2)

The **COVAR** function has the following arguments:

- **array1**: this is required and represents the first cell range of integers
- **array2**: this is also required. This is the second cell range of integers.

It should be further noted that:

- this function has been replaced with two newer functions (**COVARIANCE.P** and **COVARIANCE.S**) that may provide improved accuracy and whose names better reflect their usage. Although this function is still available for backward compatibility, you should consider using the new functions going forward, since this function may not be available in future versions of Excel
- the arguments must either be numbers or be names, arrays, or references that contain numbers
- if an array or reference argument contains text, logical values, or empty cells, those values are ignored; however, cells with the value zero are included
- if **array1** and **array2** have a different number of data points, **COVAR** returns the #N/A error value
- if either **array1** or **array2** is empty, **COVAR** returns the #DIV/0! error value
- the covariance is given by the formula:

$$Cov(X, Y) = \frac{\sum(x - \bar{x})(y - \bar{y})}{n}$$

where

\bar{x} and \bar{y}

are the sample means **AVERAGE(array1)** and **AVERAGE(array2)**, and **n** is the sample size.

Please see our example below:

	A	B	C
1	Array 1	Array 2	
2	3	9	
3	2	7	
4	4	12	
5	5	15	
6	6	17	
7			
8			
9	Formula	Description	Result
10	=COVAR(A2:A6,B2:B6)	Covariance, the average of the products of deviations for each data point pair (above)	5.2
11			

The A to Z of Excel Functions: COVARIANCE.P

As mentioned in **COVAR** (above), the sign of the covariance therefore shows the tendency in the linear relationship between the variables. The magnitude of the covariance is not easy to interpret because it is not normalised and hence depends on the magnitudes of the variables.

The normalised version of the covariance, known as the *correlation coefficient*, however, shows by its magnitude the strength of the linear relationship.

A distinction must therefore be made between:

- the covariance of two random variables, which is a population parameter that can be seen as a property of the joint probability distribution; *and*
- the sample covariance, which in addition to serving as a descriptor of the sample, also serves as an estimated value of the population parameter.

This function returns the former (population) covariance, the average of the products of deviations for each data point pair in two data sets. It is used to determine the relationship between two data sets. For example, you can examine whether greater income accompanies greater levels of education.

The **CORVARIANCE.P** function employs the following syntax to operate:

CORVARIANCE.P(array1, array2)

The **CORVARIANCE.P** function has the following arguments:

- **array1**: this is required and represents the first cell range of integers
- **array2**: this is also required. This is the second cell range of integers.

It should be further noted that:

- this function has replaced an older function (**COVAR**) and should provide improved accuracy and a name better reflecting its usage
- the arguments must either be numbers or be names, arrays, or references that contain numbers
- if an array or reference argument contains text, logical values, or empty cells, those values are ignored; however, cells with the value zero are included
- if **array1** and **array2** have a different number of data points, **CORVARIANCE.P** returns the #N/A error value
- if either **array1** or **array2** is empty, **CORVARIANCE.P** returns the #DIV/0! error value
- the population covariance is given by the formula:

$$Cov(X, Y) = \frac{\sum(x - \bar{x})(y - \bar{y})}{n}$$

where

\bar{x} and \bar{y}

are the sample means **AVERAGE(array1)** and **AVERAGE(array2)**, and **n** is the population size.

Please see our example below:

	A	B	C
1	Array 1	Array 2	
2	3	9	
3	2	7	
4	4	12	
5	5	15	
6	6	17	
7			
8			
9	Formula	Description	Result
10	=COVAR(A2:A6,B2:B6)	Covariance, the average of the products of deviations for each data point pair (above)	5.2
11			

The A to Z of Excel Functions: COVARIANCE.S

From above, we remarked that a distinction must be made between:

- the covariance of two random variables, which is a population parameter that can be seen as a property of the joint probability distribution; *and*
- the sample covariance, which in addition to serving as a descriptor of the sample, also serves as an estimated value of the population parameter.

This function returns the latter (sample) covariance, the average of the products of deviations for each data point pair in two data sets. It is used to determine the relationship between two data sets. For example, you can examine whether greater income accompanies greater levels of education.

The **COVARIANCE.S** function employs the following syntax to operate:

COVARIANCE.S(array1, array2)

The **COVARIANCE.S** function has the following arguments:

- **array1**: this is required and represents the first cell range of integers
- **array2**: this is also required. This is the second cell range of integers.

It should be further noted that:

- this function has replaced an older function (**COVAR**) and should provide improved accuracy and a name better reflecting its usage
- the arguments must either be numbers or be names, arrays, or references that contain numbers
- if an array or reference argument contains text, logical values, or empty cells, those values are ignored; however, cells with the value zero are included
- if **array1** and **array2** have a different number of data points, **COVARIANCE.S** returns the #N/A error value
- if either **array1** or **array2** is empty, **COVARIANCE.S** returns the #DIV/0! error value.

Please see my example below:

	A	B	C
1	Array 1	Array 2	
2	3	9	
3	2	7	
4	4	12	
5	5	15	
6	6	17	
7			
8			
9	Formula	Description	Result
10	=COVARIANCE.S(A2:A6,B2:B6)	Covariance, the average of the products of deviations for each data point pair in the sample (above)	6.5
11			

Upcoming SumProduct Training Courses

Location	Course	Date	Duration
Sydney	Excel Tips and Tricks	8 Oct 2018	1 day
London	Financial Modelling	8 - 9 Oct 2018	2 day
Sydney	Financial Modelling	9 - 10 Oct 2018	2 day
Brisbane	Excel Tips and Tricks	15 Oct 2018	1 day
Adelaide	Financial Modelling	22 - 23 Oct 2018	2 day
Melbourne	Excel Tips and Tricks	29 Oct 2018	1 day
Melbourne	Financial Modelling	30 - 31 Oct 2018	2 day
Darwin	Power Pivot, Power Query and Power BI	12 Nov 2018	1 day
Sydney	Power Pivot, Power Query and Power BI	12 - 14 Nov 2018	3 day
Melbourne	Excel Tips and Tricks	19 - 21 Nov 2018	3 day
Sydney	Excel Tips and Tricks	10 Dec 2018	1 day
Sydney	Financial Modelling	11 - 12 Dec 2018	2 day
Sydney	Power Pivot, Power Query and Power BI	17 - 19 Dec 2018	3 day

Key Strokes

Each newsletter, we'd like to introduce you to useful keystrokes you may or may not be aware of. This month, it's time to combine **CONTROL** with **ALT** and **SHIFT**:

Keystroke	What it does
CTRL + ALT + SHIFT + F2	Print
CTRL + ALT + SHIFT + F4	Close application
CTRL + ALT + SHIFT + F9	Recalculation (full build)
CTRL + ALT + SHIFT + TAB	Outdent

There are over 540 keyboard shortcuts in Excel. For a comprehensive list, please download our Excel file a www.sumproduct.com/thought/keyboard-shortcuts. Also, check out our new daily **Excel Tip of the Day** feature on the www.sumproduct.com homepage.

Our Services

We have undertaken a vast array of assignments over the years, including:

- **Business planning**
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- **Key driver analysis**
- **Model reviews / audits for internal and external purposes**
- **M&A work**
- **Model scoping**
- **Power BI, Power Query & Power Pivot**
- **Project finance**
- **Real options analysis**
- **Refinancing / restructuring**
- **Strategic modelling**
- **Valuations**
- **Working capital management**

If you require modelling assistance of any kind, please do not hesitate to contact us at contact@sumproduct.com.

Link to Others

These newsletters are not intended to be closely guarded secrets. Please feel free to forward this newsletter to anyone you think might be interested in converting to "the SumProduct way".

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Any Questions?

If you have any tips, comments or queries for future newsletters, we'd be delighted to hear from you. Please drop us a line at newsletter@sumproduct.com.

Training

SumProduct offers a wide range of training courses, aimed at finance professionals and budding Excel experts. Courses include Excel Tricks & Tips, Financial Modelling 101, Introduction to Forecasting and M&A Modelling.

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