

# Sum Product

NEWSLETTER #92 - July 2020

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*July is a BIG month for SumProduct* as we seek to put on our biggest event ever – namely, the Excel Virtually Global conference. It's coming this month and we have an *army* of presenters. Be there or, er, don't. It's cheap, it's cheerful and it's for charity! Details below.

In other news, Microsoft has announced a brand new function for Microsoft 365 and on the web: **STOCKHISTORY**. It's one people have been asking for and it's finally arrived!

Then there's the usual contenders: Beat the Boredom, Visual Basics, Power Pivot Principles, Power Query Pointers, Power BI Updates, the A to Z of Excel Functions (*you can get EVEN with us this month!*), Keyboard Shortcuts *et al*.

Happy reading and remember: stay safe, stay happy, stay healthy.

Until next month.

*Liam Bastick*, Managing Director, SumProduct



## Excel Virtually Global



Not long to go now... Just a reminder, this two-and-a-bit-day virtual conference, for charity, presents **more than 50** Excel, Data Platform and PowerPoint MVPs, together with other acknowledged experts from Microsoft and / or around the globe to present, answer questions and demonstrate the future of Excel and how it will make your life easier, personally and professionally.

Topics will include: Auditing Spreadsheets, Charts, Dashboards, Data Analysis, Data Types, Dynamic Arrays, Excel Tricks & Tips, Financial Modelling, Forecasting, Maps, Microsoft 365, New Functions and Features, PivotTables, Power BI, Power Pivot, Power Query, Presenting Your Data, Spilled Formulae, Testing, Timelines and VBA. It's not all in English either, with sessions in Mandarin, Portuguese, Spanish and Telugu, as well.

Each session (including Q&A) will last no more than an hour and topics cover all expertise levels, from novice to expert. Most presenters are

well known in their spheres, and have written blogs, books and articles and / or present video sessions.

Most sessions will be recorded so you may watch them later with downloads aplenty – there are no medals for staying up to watch the entire event live! That's just as well, as it will run from 17:00 GMT / UTC on Tuesday 21 July to 23:59 GMT / UTC on Thursday 23 July.

From your own favourite chair, bring a laptop, an inquisitive mind and your sense of humour. Be prepared to learn heaps. And remember, it's not just value for money, it's for charity – all profits will be donated to charity.

For more details (*e.g.* times, speakers, sessions), please go to [www.excelvirtuallyglobal.com](http://www.excelvirtuallyglobal.com) and register at [www.eventbrite.com/e/excel-virtually-global-a-virtual-excel-summit-tickets-106319837496](http://www.eventbrite.com/e/excel-virtually-global-a-virtual-excel-summit-tickets-106319837496).

Hopefully, we'll see you there!



## Gone Too Soon

It's been a terrible week for the Excel community, with the passing of Microsoft Excel team member and former Excel MVP Chris "Smitty" Smith. If you have no idea who he is, then you are unlucky, because he truly was a lovely bloke, with a great mind, unassuming temperament and a wry sense of humour. You probably know his work though – if nothing else, he was heavily involved in Excel Help.



Never seen without his signature cap, Smitty gave encouragement and advice to the entire Excel community, posting nearly 30,000 examples on Mr. Excel, for example! I usually sat next to him at the MVP Summits, where he was both hard working and laid back. I recall at the last summit fellow Excel MVP Roger Govier came across to our desk to say hello, stumbled, and poured his glass of water all over Smitty's brand new Surface Book 2, frying it instantly. Smitty immediately stood up, and checked whether his friend was OK after tripping, caring nothing for the hardware.

To my shame, I cannot say I would have had the same reaction, but that was the man. And that's why he was so well loved

Smitty leaves behind a young family, wife Cyndi and daughter Campbell, who are fiercely proud of him. If you knew him and would like to contribute, then you might wish to consider buying a copy of his recent e-Book ([www.mrexcel.com/store/index.php?l=product\\_detail&p=371](http://www.mrexcel.com/store/index.php?l=product_detail&p=371)).

He will be missed.

## New Excel Function: STOCKHISTORY



You might think that current stock trajectories are like my career path – well now you can prove it!

There's a new function in town, albeit currently a "Beta feature", which means it is only available to a portion – and not all – of the Office Insider community. However, once it has been tested further and "optimised" it will roll out to the rest of Office Insider and eventually become Generally Available in Microsoft 365 and online.

This **STOCKHISTORY** function retrieves historical data about a financial instrument and loads it as a **dynamic array**, which will spill when required (*i.e.* Excel will dynamically create an appropriately sized range once you press **ENTER**).

**STOCKHISTORY** has the following syntax:

**=STOCKHISTORY(stock, start\_date, [end\_date], [interval], [headers], [property0], [property1], [property2], [property3], [property4], [property5])**

where:

- **stock**: this is required and is a function which returns historical price data about the financial instrument corresponding to the value entered. You should enter a ticker symbol in double quotes (*e.g.* "MSFT") or else it should be a reference to a cell containing the **Stocks** data type. This will pull data from the default exchange for the instrument. You may also refer to a specific exchange by entering a four (4) character ISO market identifier code (MIC), followed by a colon, followed by the ticker symbol (*e.g.* "XNAS:MSFT")
- **start\_date**: this argument is also required, and represents the earliest date for which data is to be retrieved. It should be noted that if **interval** (*see below*) is not 0 (daily), the first data point may be earlier than the **start\_date** provided: instead, it will be the first date of the period requested
- **end\_date**: this argument is the first optional element. This represents the latest date for which data will be retrieved. If omitted, the default is today (**TODAY()**). It should be noted in this instance that history for the current day is not provided if the market has not yet closed, but that the historical data table will be updated within a few hours of the close of the market. In the meantime, the **Stock** data type may be refreshed to show the current price, even though the **STOCKHISTORY** function cannot presently display it
- **interval**: this argument is option and denotes the interval each data value represents as follows:

Interval	Periodicity
0 (default)	Daily
1	Weekly
2	Monthly

- **headers**: another optional argument. This specifies whether to display headings as follows:

Headers	Display
0	No headers shown
1 (default)	Show headers
2	Show instrument identifier and headers

When included, **headers** are rows of text that are part of the array returned by the function.

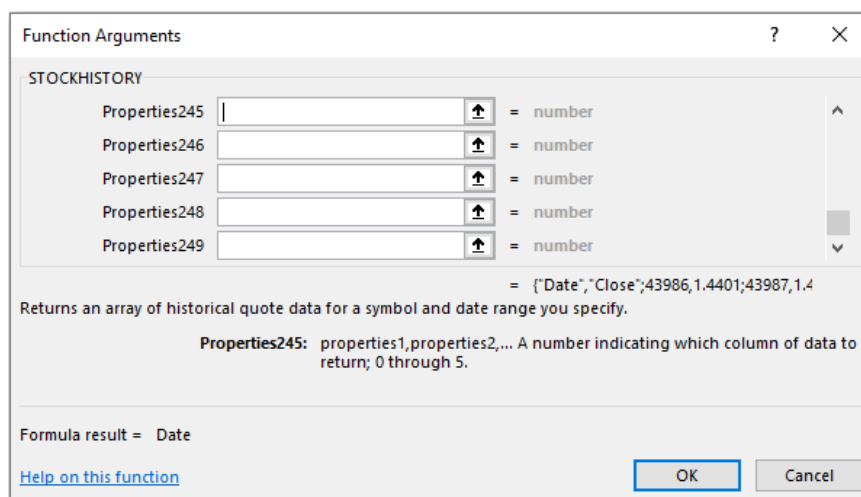
It is noted that on initial release the headers may not always display, but we are sure this bug will be fixed shortly. In the meantime, it's a small price to pay for this very useful function!

- **property0 to property5**: these arguments are also optional. The columns that are retrieved for each stock are as follows:

Value	Attribute	Definition
0	Date	First valid trading day in the period
1	Close	Closing price on the last trading day in the period
2	Open	Opening price on the last trading day in the period
3	High	Highest price of the highest day's high in the period
4	Low	Lowest price of the lowest day's low in the period
5	Volume	Volume traded during the period

It should be noted that there are six placeholders (i.e. **property0** through **property5**), but this does not mean 'Date' (0) has to be **property0**, 'Close' has to be **property1** etc. If any of them are present, only the indicated columns are returned in the order provided. The default setting is 0,1 (i.e. 'Date' and 'Close') if omitted.

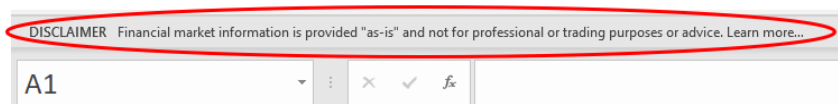
You can tell **STOCKHISTORY** is not yet a "mature" function as Excel Help is a little confused. Presently, it appears you may have 249 properties!



It should be noted that:

- the **STOCKHISTORY** function does not stamp a format on the cells that it spills into. If you delete the formula, the cells that it filled have the General format
- especially if you omit the final comma, the result may not display immediately (for instance, until another action is taken); you may see the **#BUSY!** message instead. This is not an error (please see **ERROR.TYPE** for more information) – Excel is just busy!
- when you enter the **property** arguments, you type a number for each property 0 through 5, in the order you want to see them. The value you enter for each property corresponds to the property number. For example, to include Date, Open and Close, enter **0,2,1**
- date arguments may be a date enclosed in double quotes (e.g. "01-01-2020") or a formula (e.g. **TODAY()**) or a cell reference to a cell with a date
- the date returned may be earlier than the date provided. For example, if December 31, 2019 is provided as the start date and interval is monthly, then December 1, 2019 will be returned as that is the start date for the period requested
- when you use the **Stocks** data type or the **STOCKHISTORY** function to obtain stock prices and other company information, that information is provided by another company. Full details of the third party providers may be found [here](#).

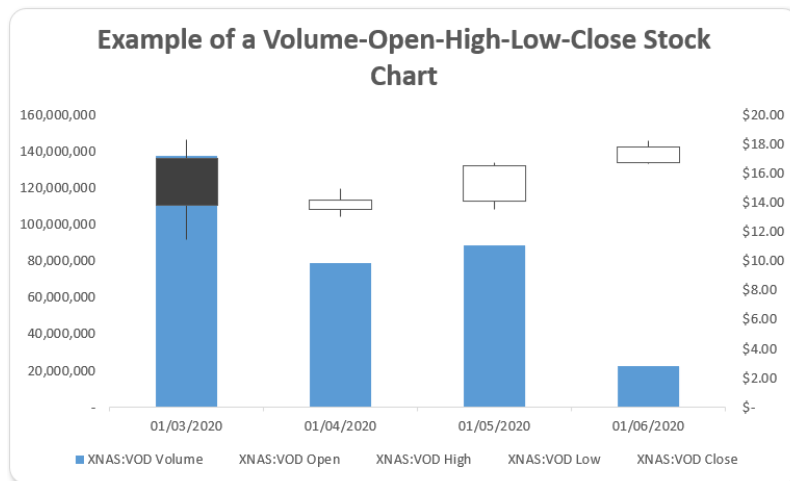
When first used, you may note the disclaimer above the formula bar, viz.



- the **STOCKHISTORY** function belongs to the **Lookup & Reference** family of functions.

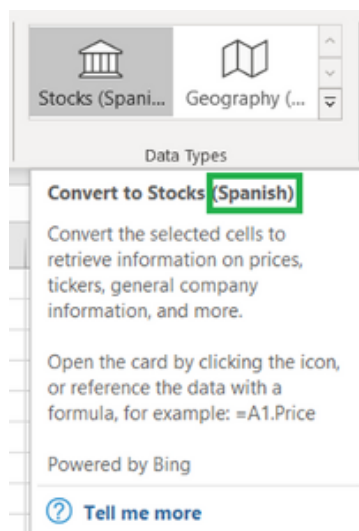
Please see the example below:

	A	B	C	D	E	F	G	H	I	J	K	L	M
1													
2		#BUSY!											=STOCKHISTORY("BHP","1 June 20")
3													
4		Date	Close										=STOCKHISTORY("BHP","1 June 20",)
5		01/06/2020	\$ 48.25										
6		02/06/2020	\$ 49.77										
7		03/06/2020	\$ 50.48										
8		04/06/2020	\$ 50.40										
9		05/06/2020	\$ 51.45										
10		08/06/2020	\$ 52.68										
11		09/06/2020	\$ 52.28										
12													
13		Date	Close										=STOCKHISTORY("MSFT","1 Jan 20","30 Jun 20",2,)
14		01/01/2020	\$ 170.23										
15		01/02/2020	\$ 162.01										
16		01/03/2020	\$ 157.71										
17		01/04/2020	\$ 179.21										
18		01/05/2020	\$ 183.25										
19		01/06/2020	\$ 189.80										
20													
21		Date	Close										=STOCKHISTORY("MSFT","1 Jan 20","31 Mar 20",2,2)
22		01/01/2020	\$ 170.23										
23		01/02/2020	\$ 162.01										
24		01/03/2020	\$ 157.71										
25													
26		XNAS:VOD											=STOCKHISTORY("VOD","7 Mar 20",2,2,0,5,2,1,3,4)
27		Date	Volume	Open	Close	High	Low						
28		01/03/2020	137,152,947	\$ 17.01	\$ 13.77	\$ 18.30	\$ 11.46						
29		01/04/2020	78,831,243	\$ 13.50	\$ 14.14	\$ 14.93	\$ 13.00						
30		01/05/2020	88,448,704	\$ 14.04	\$ 16.51	\$ 16.68	\$ 13.52						
31		01/06/2020	22,222,626	\$ 16.69	\$ 17.75	\$ 18.18	\$ 16.66						
32													



Pretty cool, eh?

**Additional Language Support for Stocks and Geography Data Types**



If you are presently subscribing to the Beta channel of Microsoft 365 (for either Windows or MacOS), then you have a 50% chance of finding that with the latest update you now have limited additional language support for the Stocks and Geography Data Types. Please note that additional language support for Excel on the Web will be “coming later”.

Whilst it’s true that the Stocks and Geography Data Types have been available for some time, they have only been available in English (i.e. to customers who have English as an editing language in their workbooks).

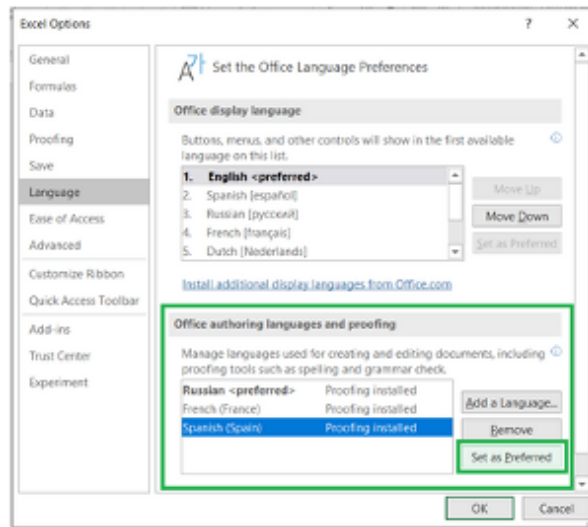
That’s now changed as these two Data Types have now been propagated to a broader audience by Microsoft now supporting Stocks and Geography in French, German, Italian, Portuguese and Spanish.

You will have access to **any** Data Type that is supported by one or more languages chosen in your authoring language settings. For English, Spanish, French, German, Italian, and / or Portuguese, this includes both Stocks and Geography.

You can ensure data types will be created in the language you want by setting it as your preferred authoring language:

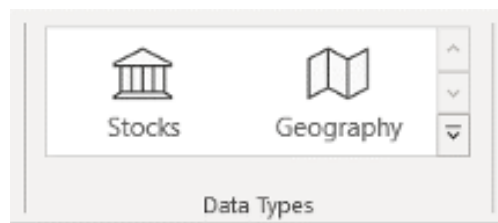
- for **Office on Windows**, you can change this setting in **File -> Options -> Language**. Under ‘Office authoring languages and proofing’, select the language you want and then select ‘Set as Preferred’
- for **Office on MacOS**, you can configure this by going to the Apple menu, choosing **System Preferences -> Language & Region**, and set the desired language to be your preferred language by dragging it to the top of the ‘Preferred languages’ list.

Be aware, whichever platform you use, you may have to restart Excel twice after making a change to your language settings to ensure the Data Type service registers the change.



After you have configured your language settings, it’s pretty straightforward. Simply start by typing text in a cell, such as the name of a city or country for geographic data, or a ticker symbol for stock data. Just make sure you type your text in the language you want to be using for the Data Type!

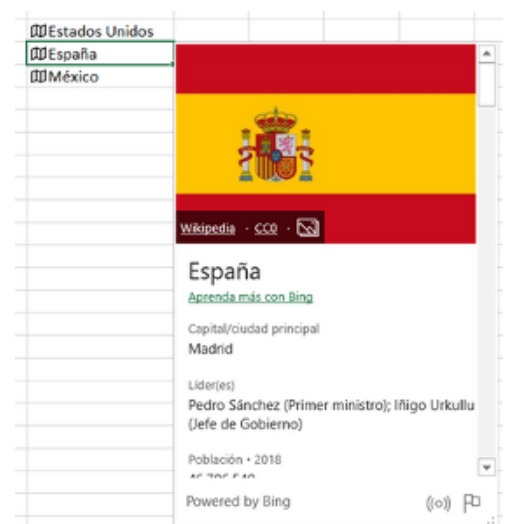
We’ve explained how to use these **Data Types** before. Select your cells containing text and go to the Data tab in the Ribbon. There, you will see the relevant buttons in the ‘Data Types’ group. Select the button corresponding to the Data Type you want to create:



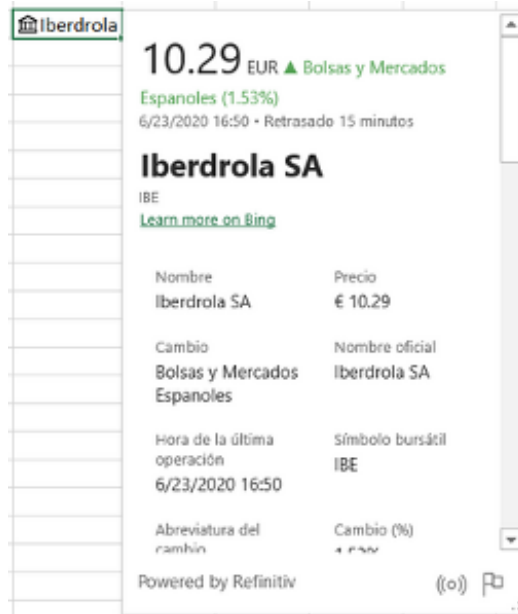
Mine is English because I only speak two languages, English and Profanities. You will see that the text for these buttons will match your Office display, although the Stocks and Geography buttons will still look similar.

If you configure your settings so that your preferred authoring language is not supported for a Data Type, but a supported language is included in the list, the data types created will fall back to using one of the supported languages.

After you have converted the selected text into the Stocks or Geography Data Types, an icon will appear in the cell. If you click on the icon, you will see the associated card:



The card reveals a list of fields and corresponding values. The point is, you will be able to see that the field names and values are created in the configured language.



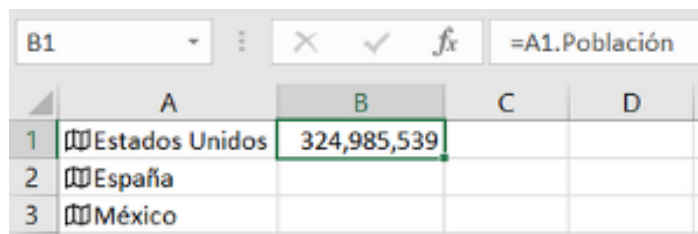
Data Types will persist in the language that they were created in. Therefore, be careful: changing your language settings and performing a data connection refresh of the data will not change the display name, field name or field values in the Data Type.

Fields like *Nombre*, *Precio* and *Población* are the “buckets” of information that make up the Data Type. When a Data Type has been created in a certain language, it means that all the field names and field values for that Data Type are forever in that language.

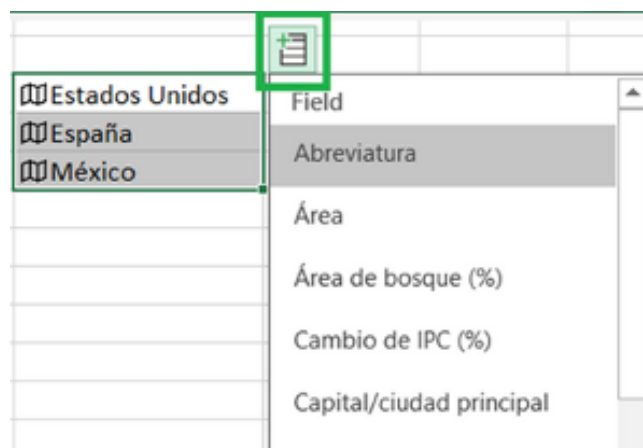
You can use these field names as identifiers in formulae and calculations using the already established dot notation. For example, the formula

**=A1.Población**

uses dot notation after referencing cell **A1**, then using a period, followed by the field name. This will result in the formula evaluating, and the field value being shown in the cell.



Another way to insert a field into the workbook is by using the ‘Insert Data’ button on the card, on a cell or next to a table.



Just remember, the Data Type will persist in the language it was created in!

## Beat the Boredom Challenge

With many of us currently “working from home” / quarantined, there are only so Zoom / Teams calls you can make before you reach your data limit. Perhaps they should measure data allowance in mugs of coffee. To try and keep our readers engaged, we will continue to reproduce some of our popular **Final Friday Fix** challenges from yesteryear in this and upcoming newsletters. One suggested solution may be found later in this newsletter. Here’s this month’s...

This month, we’ve posed an interesting problem that is easy to explain, but more difficult to test – given a series of numbers, and a target sum, can you get Excel to tell you which combination of numbers will result in the sum being achieved?

For example, with a target of 10 and the numbers:

Number
9
5
2
3
7
1

... we should expect to see the results of 9 + 1, 7 + 3, 7 + 2 + 1 and 5 + 2 + 3 (in no particular order).

Some rules:

- No macros / VBA
- No array (**CTRL + SHIFT + ENTER**) functions
- No Solver or other iterative tools (*i.e.* no circular references)
- Feel free to use Power Query if you think it will help.

It’s deceptively easy, but gets exponentially harder as you include more numbers to check. Sound easy? Try it. One solution may be found later in this newsletter – but no reading ahead!

## Visual Basics

We thought we’d run an elementary series going through the rudiments of Visual Basic for Applications (VBA) as a springboard for newer users. This month, we’re going to look at a common application of VBA involving a range of skills that we’ve gone through.

This month, we are going to create a VBA script that will look through all the sheets of a workbook and unhide the worksheets, unprotect them if necessary, and unhide the columns and rows. This is useful to help identify the entirety of a file.

The first step involves declaring a Worksheet variable. We can do this with the code:

```
Dim ws as Worksheet
```

We can then loop through all of the worksheets using the following loop:

```
For Each ws in ActiveWorkbook.Sheets
```

```
...
```

```
Next ws
```

Inside the loop, each worksheet will be defined by the variable “ws”. With this, we can perform additional commands, such as:

```
ws.Visible = xlSheetVisible
```

```
ws.Activate
```

```
ws.Unprotect
```

```
ws.Rows.EntireRow.Hidden = False
```

```
ws.Columns.EntireColumn.Hidden = False
```

Hopefully, all of these lines of code make logical sense! If not, they perform the following actions:

- unhide the relevant sheet
- select and activate the sheet
- unprotect the sheet if it is protected
- take all of the rows and unhide them
- take all of the columns and unhide them.

To put the whole piece of code together, it would look like the following:

```
Sub UnhideAll()  
Dim ws As Worksheet  
For Each ws In ActiveWorkbook.Sheets  
    ws.Visible = xlSheetVisible  
    ws.Activate  
    ws.Unprotect  
    ws.Rows.EntireRow.Hidden = False  
    ws.Columns.EntireColumn.Hidden = False  
Next ws  
End Sub
```

More next time.

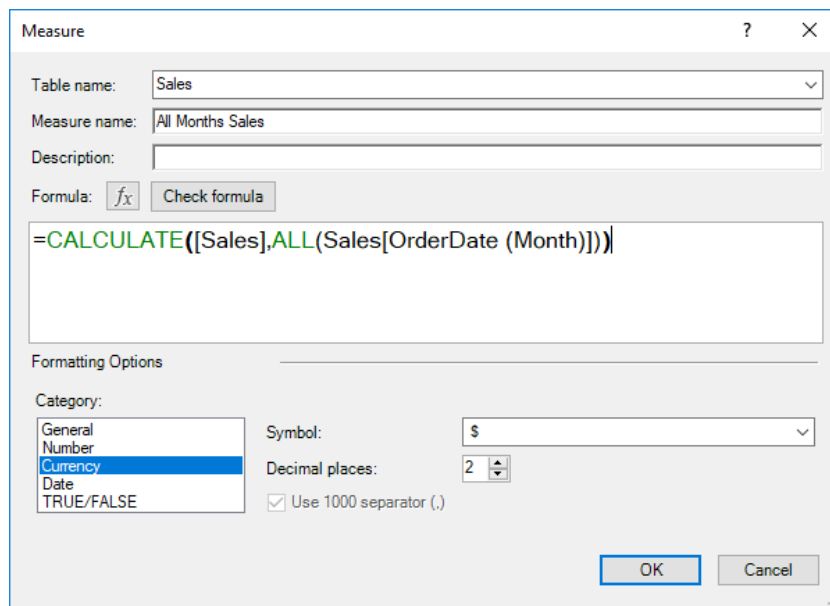
## Power Pivot Principles

We continue our series on the Excel COM add-in, Power Pivot. This month, we look at the ALL function in DAX.

In Power Pivot, the **ALL** function returns all of the records in a table, or all of the values in a column, ignoring any filters that might have been applied for the file under scrutiny. This function is useful for clearing filters and creating calculations on all rows in a given table.

Let's expand upon the **CALCULATE** function, discussed back in April's newsletter. Here, I am going to create a simple 'All Months Sales' measure:

```
=CALCULATE([Sales],ALL(Sales[OrderDate (Month)]))
```

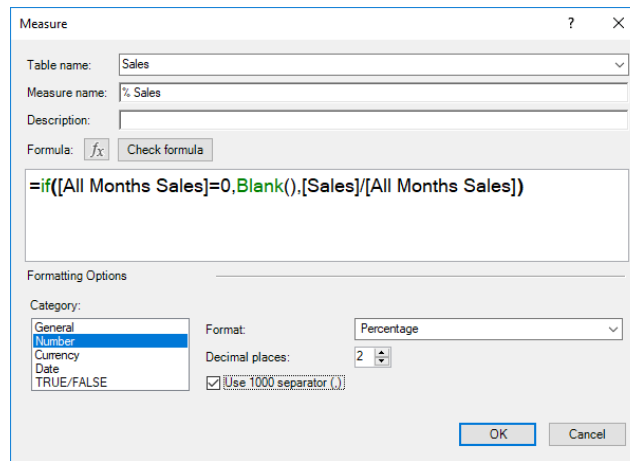


Our resulting PivotTable will look something like this:

Column Labels		2014
Row Labels	Sales	All Months Sales
Jan		\$29,502.45
Feb		\$29,502.45
Mar		\$29,502.45
Apr		\$29,502.45
May		\$29,502.45
Jun		\$29,502.45
Jul	\$4,128.10	\$29,502.45
Aug	\$4,239.10	\$29,502.45
Sep	\$4,298.25	\$29,502.45
Oct	\$4,580.40	\$29,502.45
Nov	\$5,334.95	\$29,502.45
Dec	\$6,921.65	\$29,502.45
<b>Grand Total</b>	<b>\$29,502.45</b>	<b>\$29,502.45</b>



What next? It sort of stands out, doesn't it? From the **CALCULATE** and **ALL** functions, I can now combine them to create a percentage sales measure which will reflect the inherent seasonality (well, for the last six months anyway):



Remember to include an error trap.

Our PivotTable should look something like this now:

Column Labels			
2014			
Row Labels	Sales	All Months Sales	% Sales
Jan		\$29,502.45	
Feb		\$29,502.45	
Mar		\$29,502.45	
Apr		\$29,502.45	
May		\$29,502.45	
Jun		\$29,502.45	
Jul	\$4,128.10	\$29,502.45	13.99%
Aug	\$4,239.10	\$29,502.45	14.37%
Sep	\$4,298.25	\$29,502.45	14.57%
Oct	\$4,580.40	\$29,502.45	15.53%
Nov	\$5,334.95	\$29,502.45	18.08%
Dec	\$6,921.65	\$29,502.45	23.46%

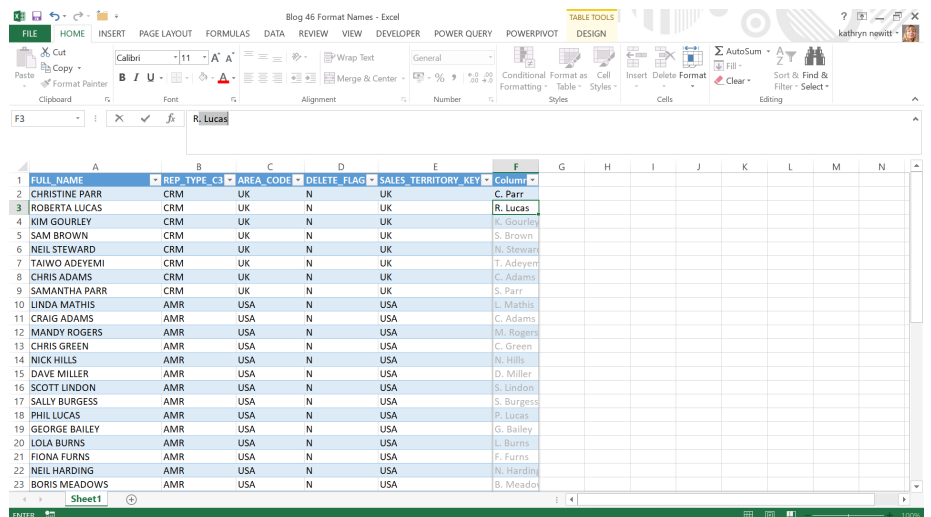
Not only is this percentage calculated from 2014's total sales, this measure will always be a percentage. This is subtly different from a normal PivotTable, where percentages may be viewed by changing the Value Field Settings rather than an absolute (dollar) amount. Since this measure is based on a month's sales divided by all months' sales, this figure will remain a value between zero and one no matter how it is formatted or displayed.

More *Power Pivot Principles* next month.

## Power Query Pointers

Each month we'll reproduce one of our articles on *Power Query (Excel 2010 and 2013) / Get & Transform (Office 365, Excel 2016 and 2019)* from [www.sumproduct.com/blog](http://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 how to convert names into an alternative format.

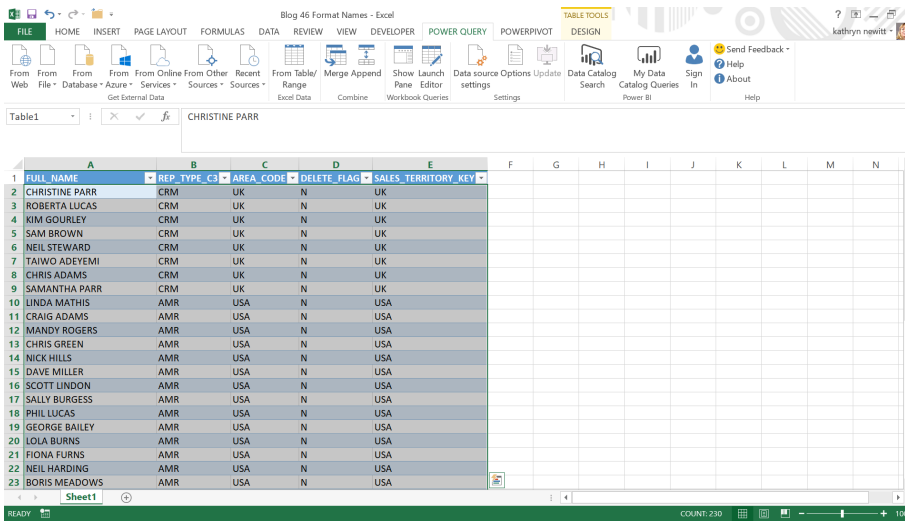
When changing the format of names in a list, Excel (2013 onwards) has some nice features to help you. The screenshot below shows how Excel 2013 (*say*) anticipates the format for the rest of our data after we have entered just two examples:



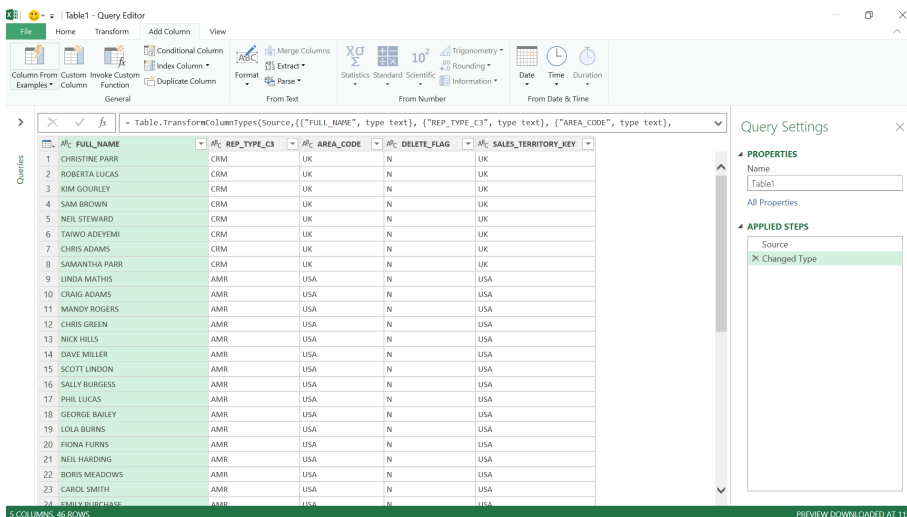
Flash Fill is a great Excel feature, but after we have built a workbook and incorporated it into pretty reports, you find out that there has been a massive change in staff, and you have to do it all again! Power Query can be refreshed; therefore, is there an easy way to do this in Power Query?

Let's see.

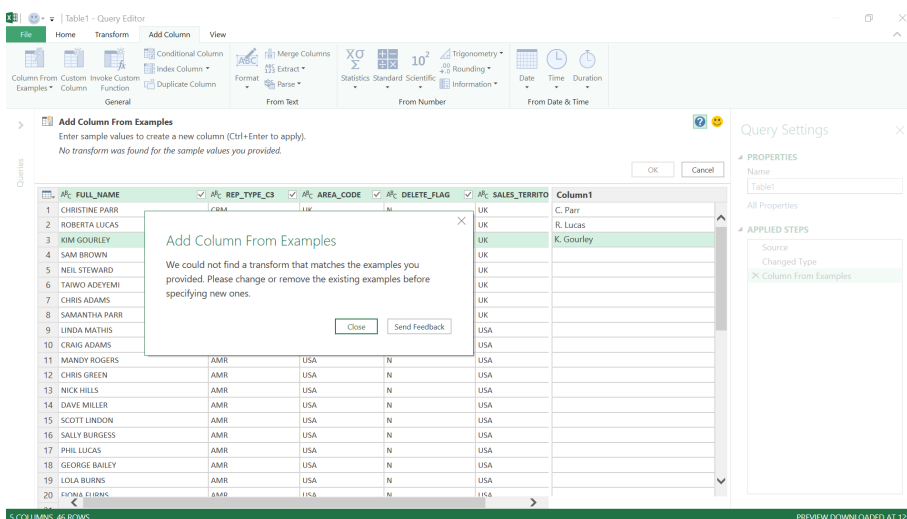
We'll upload the data by using the 'Excel Data', 'From Table / Range' option in the 'POWER QUERY' tab viz.



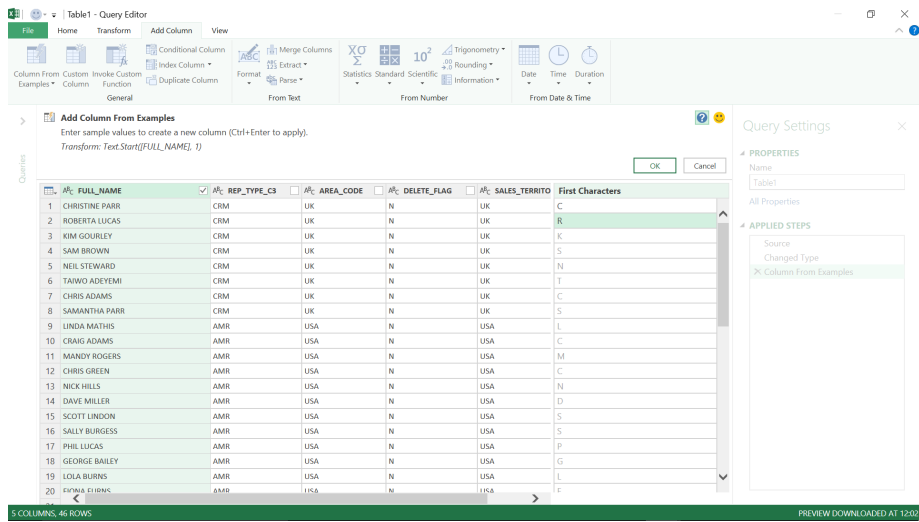
We have seen examples of achieving the desired result by using some GUI features and some M code, but for this example, our aim is to use entirely GUI options. The ideal answer would be to use the 'Column from Examples' option in the 'General' section of the 'Add Column' tab:



The concept of this functionality is similar to Flash Fill in Excel; you type a couple of examples and Power Query does the rest.



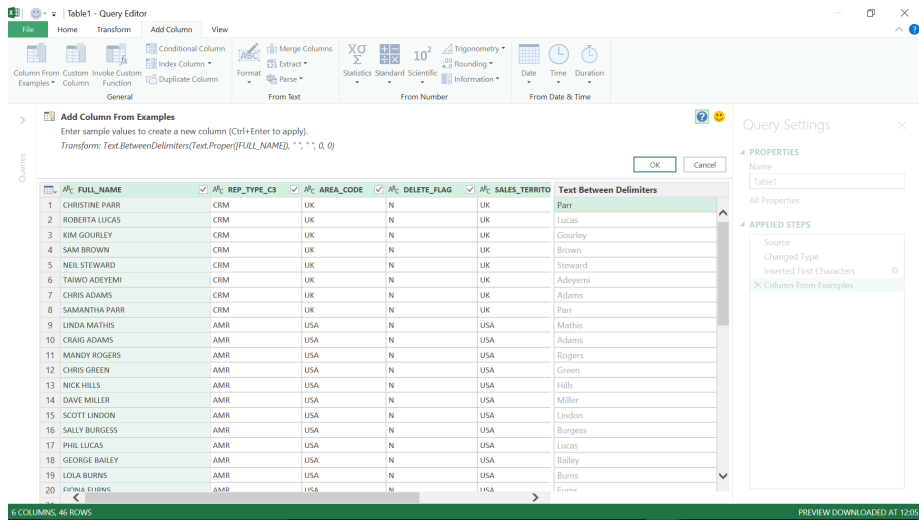
Well, it clearly isn't quite that clever yet. We need to break it down into steps that Power Query can manage. We could use the functionality available in the Transform tab, but to keep it simple let's stay in 'Add Column from Examples'. We need to extract the first initial, so we'll start with this step.



This time, Power Query has provided me with the formula it has used to work out the rest of the column:

**Text.Start([FULL\_NAME],1)**

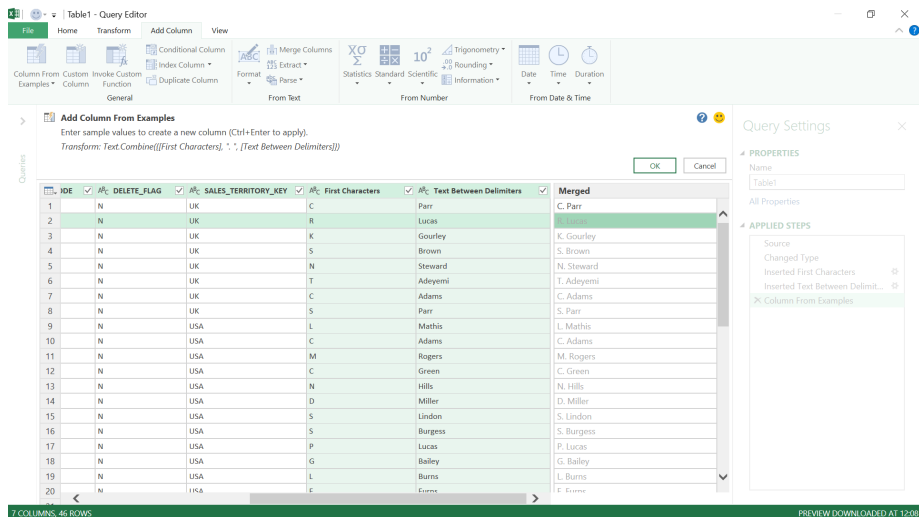
This is easy enough to follow: go to the start of the text and get the first letter. Next, we need to extract the surname. We'll also try reformatting so that it's not all in upper case.



Power Query is happy to change the type to Proper text, work out the delimiter and get the text after that delimiter:

**Text.BetweenDelimiters(Text.Proper([FULL\_NAME]), " ", " ", 0, 0)**

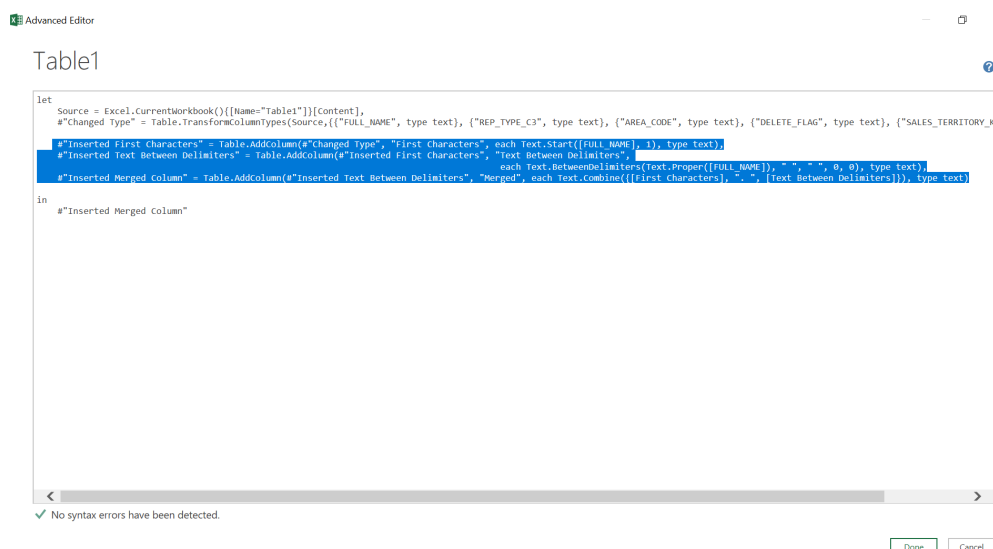
Not bad. All we need to do now is combine our two new columns and we'll add a full stop after the initial:



The new column is looking good after just one example, and the **M** code behind the step is shown in the top window:

```
Text.Combine({[First Characters], ". ", [Text Between Delimiters]})
```

Therefore, Power Query has created the **M** code that we need in three steps, and we may view them in the Advanced Editor. The editor shows the full version of the **M** code required to complete each step in sequence.



```
#"Inserted First Characters" =
```

```
Table.AddColumn(#"Changed Type", "First Characters",
each Text.Start([FULL_NAME], 1), type text),
```

```
#"Inserted Text Between Delimiters" =
```

```
Table.AddColumn(#"Inserted First Characters", "Text Between
Delimiters", each
Text.BetweenDelimiters(Text.Proper([FULL_NAME]), " ", " ", 0, 0),
type text),
```

```
#"Inserted Merged Column" =
```

```
Table.AddColumn(#"Inserted Text Between Delimiters", "Merged",
each Text.Combine({[First Characters], ". ", [Text Between
Delimiters]}), type text)
```

Now this code has been created for us, if the data on the employee list changes, we may simply refresh to implement all the steps.

More next month!

## Power BI Desktop Latest Updates

Things are back to normal this month, with announcements on time and fewer than 10 million updates! Several features have become Generally Available with this release, including automatic page refresh, the hierarchy slicer, the modern Ribbon and AI insights. That's not all though.

Here's the full list of updates:

### Reporting

- Enhancements to mobile layout authoring
  - o New phone emulator
  - o Updated Visualization pane
  - o Support for overlaid visuals
- Automatic page refresh is now Generally Available
- Hierarchical slicer is now Generally Available
- New options for expand / collapse icons

- o Icons now scale with font size
- o Ability to customise indentation for child items
- o Supported with AI visuals
- Modern Ribbon is now Generally Available
- Row Level Security (RLS) is now supported for Featured Tables in Excel's Data Types gallery

### **Analytics**

- AI Insights are now Generally Available

### **Visualisations**

- Line chart dot formatting options
- Radar chart by MAQ Software
- ValQ for Modern Visual Planning
- Advanced Trellis by xViz
- Updates to Gantt chart by xViz
- Updates to Cards with States by OKViz

### **Template Applications**

- Agile HR Analytics
- Uber User Data Report

### **Modelling**

- Model view enabled for Live Connect (Preview)
- Updates to Model view

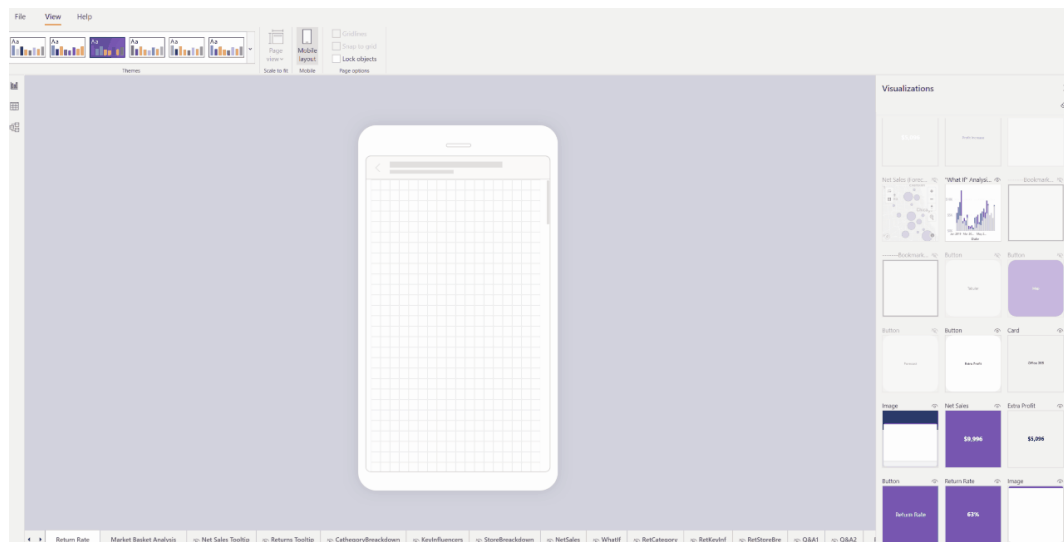
### **Data Connectivity**

- Palantir Foundry connector.

Let's take a look at each in turn.

### **Enhancements to mobile layout authoring**

In this release, Microsoft has introduced an improved mobile layout authoring experience together with additional mobile layout capabilities. As the Power BI Mobile apps have increasingly been adopted by more and more organisations, it has been realised the functionality needs to be improved.



There are several new experiences and capabilities that will help you build optimised mobile reports:

- New phone emulator
- Updated Visualization pane
- Support for overlaid visuals.

## NEW PHONE EMULATOR

One of the first things that is noticeable about the new experience is that the phone emulator or phone canvas has been revamped. The new fine-grained grid gives you more flexibility in resizing and placing visuals, and a longer canvas allows you to add more visuals to your page too.

## UPDATED VISUALIZATION PANE

The Visualizations pane has been improved too. Now, you can find your required visual by looking for its name, and you can also easily differentiate between hidden and displayed visuals.

## SUPPORT FOR OVERLAID VISUALS

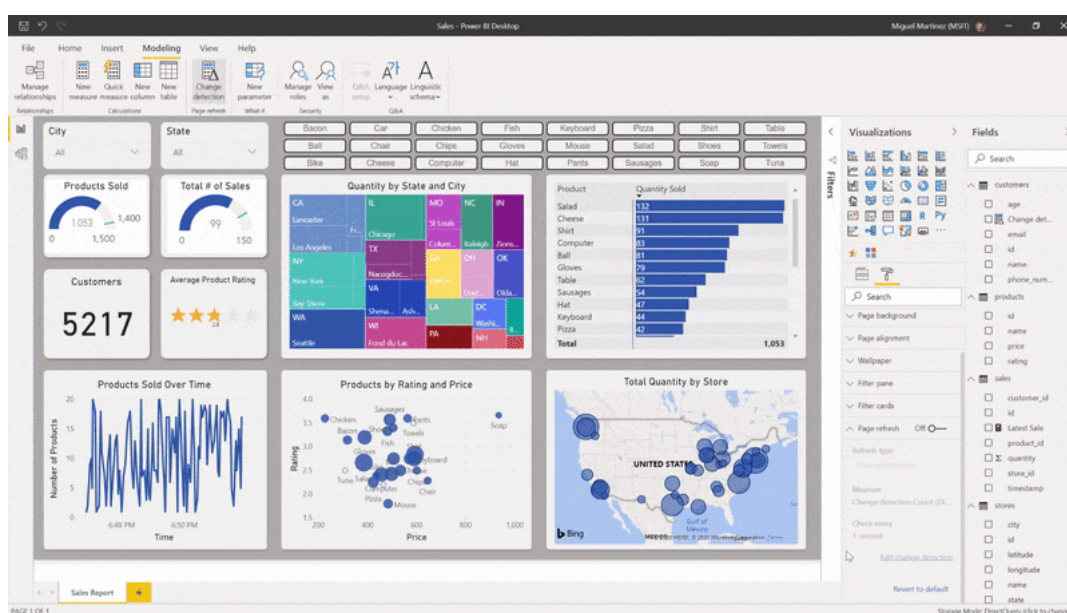
Another improvement is that you can now place one visual on top of another. This lets you use the same design techniques used in the web layout for building interactive reports using bookmarks. You can also create reports by layering visuals over images.

To start designing a mobile-optimised report, go to **View- > Mobile layout**, and drag and drop your visuals onto the canvas.

## Automatic page refresh is now Generally Available

Back in October 2019 automatic page refresh was introduced in Preview. This feature allows you to set the refresh interval of visuals in your report when using a Direct Query source. For fast updating sources, this near real-time experience allows consumers to monitor time-critical reports and ensure that they are always viewing the latest data. Then, in April

2020, the option to perform page refreshes with change detection was added for Premium capacities, allowing you to have a lightweight query that runs in the background to check if data has changed and only refresh your entire report page if a change has been detected.

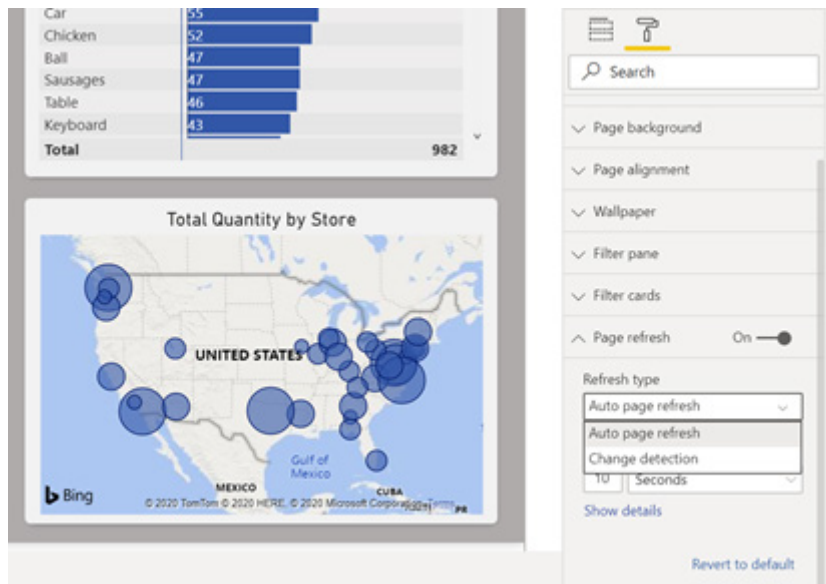


With this release, this brings the feature full circle, as it becomes Generally Available, fully supporting any interval and settings in Power BI Desktop. It should be noted that when publishing to the Power BI Service the following restrictions apply:

- **Automatic page refresh:** this is supported in both Power BI Pro and Premium. Pro has a minimum refresh interval of 30 minutes and Premium has default minimum of five (5) minutes. In the case of Premium, capacity administrators may turn the feature on / off and increase or reduce the interval allowed. The fastest refresh possible is one (1) second
- **Change detection measure:** this is only supported in Power BI Premium. The default minimum in Premium is five (5) seconds. Capacity administrators may turn the feature on / off and increase or reduce the interval allowed. The fastest interval possible is one (1) second. Only one change detection measure is allowed per model
- Both capabilities are enabled by default with the interval minima described previously
- **Performance analyzer in Desktop:** change detection measure shows up in the performance analyzer for authors to optimise the measure itself. Automatic page refresh queries show up as visuals refreshing every interval set up by the author
- **Capacity metrics app:** all queries generated by these capabilities show up in the capacity metrics apps to be tracked and take action, if needed. In the near future, Microsoft has stated it will be adding the capability to filter by type of query too.

To start using the new refresh types for Direct Query, make sure you connect to a supported source, and head to the 'Page Format' pane to find 'page refresh':

- **Automatic page refresh:** enable the toggle, select 'Auto page refresh' and define a duration for your refresh
- **Change detection:** add a new change detection measure or select an existing one going to the change detection dialog in the Modeling section of the Ribbon, right-clicking on the field list and selecting change detection, or head to the Formatting pane for that page and select 'change detection'.



**Hierarchical slicer is now Generally Available**

February saw the release of a Preview of the hierarchical slicer. This update makes the feature now Generally Available. This release included several improvements:

- new options for expand / collapse icons
- icons now scale with font size
- the ability to customise indentation for child items
- supported with AI visuals.

**NEW OPTIONS FOR EXPAND / COLLAPSE ICONS**

Originally, you only had one option for the expand and collapse icons, which were chevrons:



While the chevron icon is still the default option, there are now two additional options:

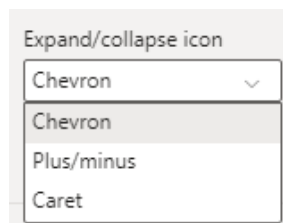
- Plus/minus



- Caret

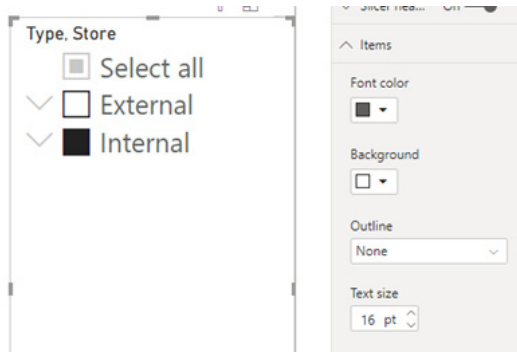


To find these options, select your hierarchical slicer and navigate to the **Format pane -> Items -> Expand / collapse icon**:



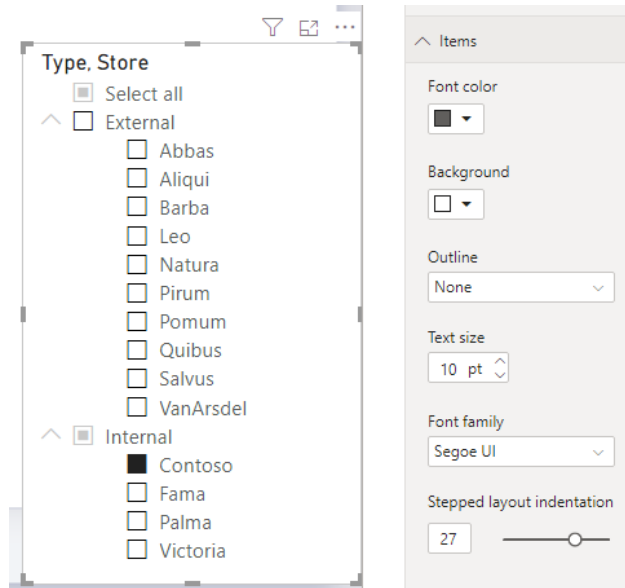
**ICONS NOW SCALE WITH FONT SIZE**

This next improvement is not just for hierarchical slicers, but for all slicers: the icons in the slicer now scale with the font size. For example, here is an illustration demonstrating that the icons have scaled to match the text sized, which has been increased to 16 pt:



### ABILITY TO CUSTOMISE INDENTATION FOR CHILD ITEMS

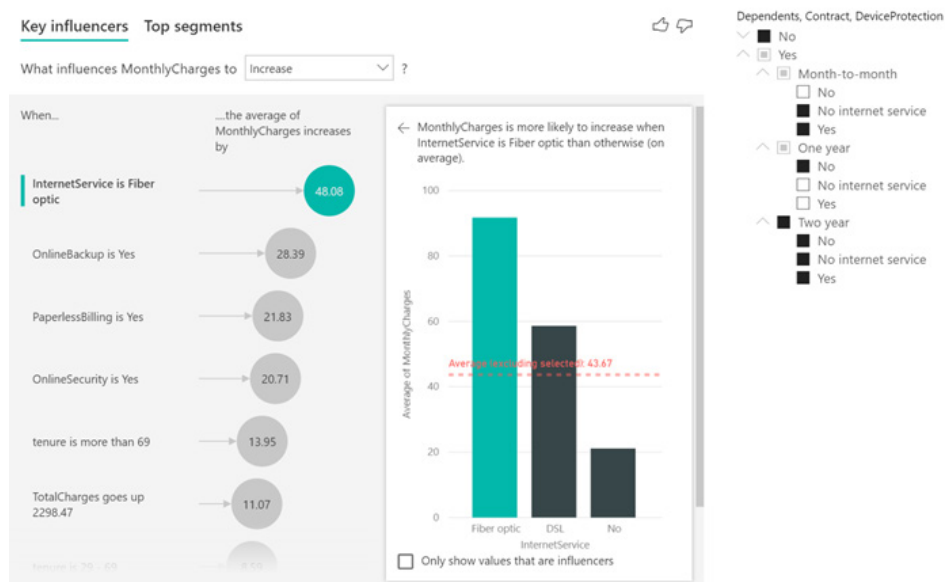
Power BI has added the option for you to now customise the indentation for the child items in the hierarchy.



To find this setting, select your hierarchical slicer and navigate to the **Format pane -> Items -> Stepped layout indentation**.

### SUPPORTED WITH AI VISUALS

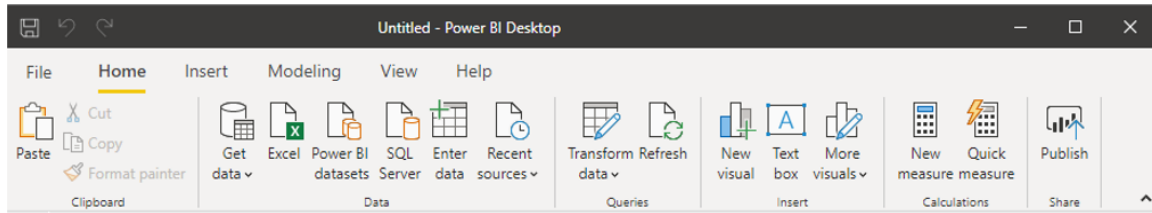
Another addition to this release is that the hierarchical slicer is now supported with AI visuals. For example, the hierarchical slicer is cross-filtering the Key influencers visual:





## Modern Ribbon is now Generally Available

The modern Ribbon is now Generally Available. Microsoft has advised they will continue to make additions and add more features to this new Ribbon in future (although precise timelines have not been stated).

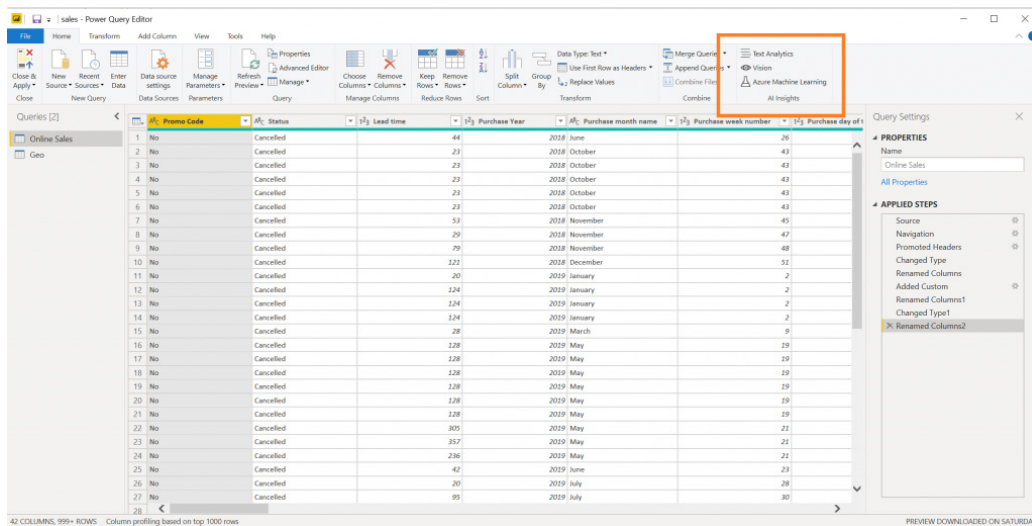


## Row Level Security (RLS) is now supported for Featured Tables in Excel's Data Types gallery

The featured tables capability has been improved this month with Row Level Security (RLS) support. Now, when you mark a table as featured and then publish to the Power BI Service, that table will appear in Excel's data types gallery, even if it has RLS rules applied. Previously, these tables were not shown in Excel. This new enhancement means that users in Excel will only see the rows of data they have access to.

## AI Insights are now Generally Available

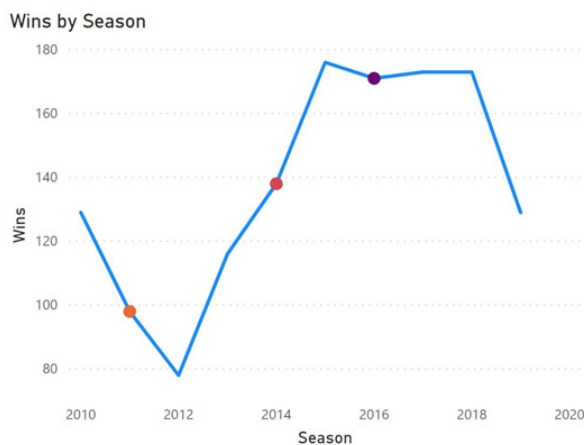
AI Insights in Power Query are now Generally Available. AI Insights give you access to a collection of pre-trained machine learning models that enhance your data preparation efforts. These include text analytics functions (sentiment scoring, key phrase extraction and language detection) and image detection, as well as connectivity to Azure ML models.



Please note that the text analytics and image detection functions require access to an AI workload (all Premium nodes and A3 / EM3 and above). Connectivity to Azure ML models is available to all users.

## Line chart dot formatting options

This month, there is a new formatting update to line charts. Now, you can have different coloured dots for categories across all of your series. This update can help you call out particular points in your line charts.



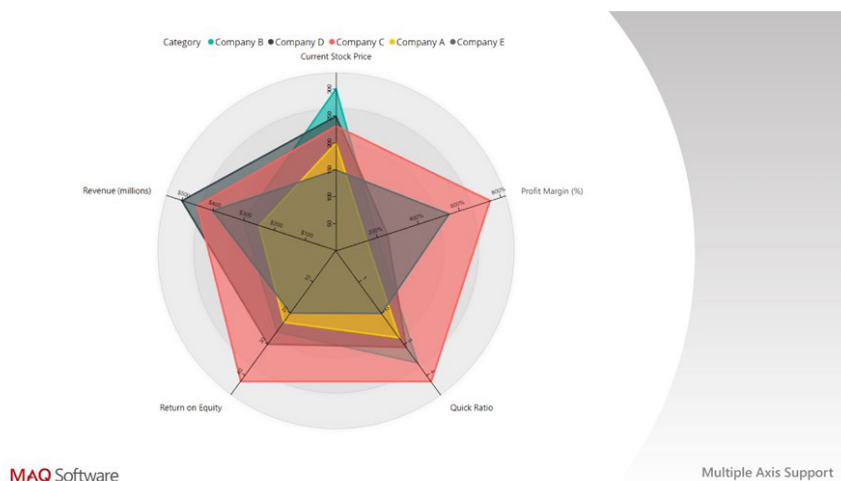
To turn this on, go to the 'Data colors' tab in the Formatting pane. In it, you should see all the categories in a series. There you may change the colour of the dot(s) for each category.



If you want to remove the dots from your line chart, just click the 'Revert to default' button. Note that in this release, this feature will show dots for your categories across all of your series. In the coming releases, Microsoft plans to extend this feature to allow for more control over choosing particular series.

### **Radar chart by MAQ Software**

A Radar chart consists of a sequence of equiangular spokes (your new word for the day!), with each spoke representing one of the variables. A line is drawn connecting the data values for each spoke which gives the plot a star-like appearance.



Example where this might be used:

- **Finance:** compare the performance of multiple companies along multiple business parameters, such as sales, profit, etc.
- **Product management:** compare products across multiple features / specifications
- **People operations:** outlines employee competencies across the Key Performance Indicators (KPIs).

Key features include:

- ability to plot multivariate data
- configurable curve interpolation method
- ability to change stroke width and transparency of plot colour
- display data points on plot, set colour and data point radius
- ability to change colours for plots
- configurable legend positioning and formatting
- ability to show / hide axes, customise axes' colour, stroke width and position
- cross-filter other visuals and legend interactivity
- support for context menu
- display data values and set text colour.

### ValQ for Modern Visual Planning

ValQ for Modern Visual Planning is a new Power BI certified visual that lets businesses meet their planning, simulations, and analysis needs all within Power BI – without the need for any server, database or IT support. This multi-purpose application supports multiple use cases across the enterprise, including what-if simulations, business and process modelling, sales / finance / operations planning, forecasting, budgeting, value driver planning, variance analysis, sensitivity analysis, attribution analysis and time series forecasting.

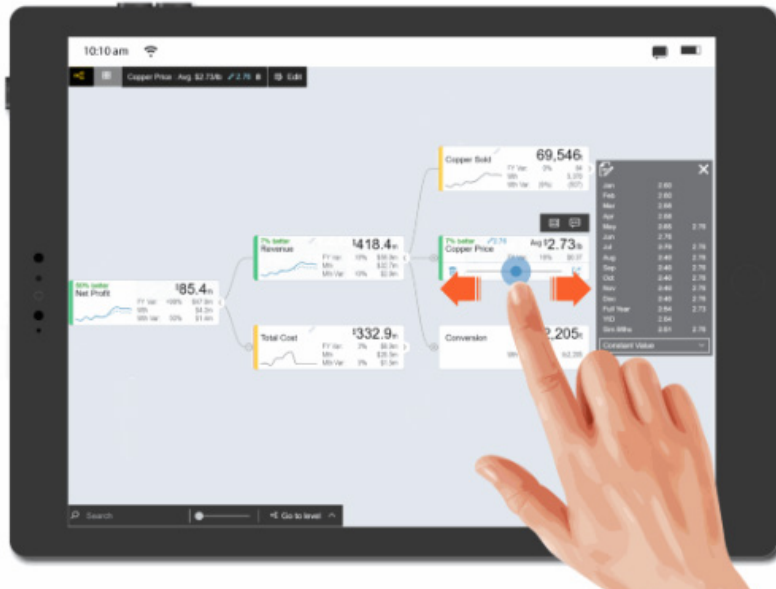
ValQ now offers an intelligent planning grid that allows planners to leverage various spreading and allocation methods (e.g. weights-based,

driver-based, trend-based, equal). The planning grid also packs several advanced features such as allocation history and cell-level commenting.

You can quickly forecast using popular time-series forecasting methods for Linear Trend, Moving Average or Weighted Moving Average, without having to write these algorithms yourself in R or Python. There is also an auto-forecast capability without requiring the user to choose a specific time-series forecasting method, and this feature helps users select the best fit based on their actual historical data.

The following are the list of key features in ValQ (PBI Certified Edition):

- connect to data sources and data models that are natively supported by Power BI
- create your planning models quickly based on your data model
- leverage intelligent planning grid to create and manage budgets for future periods
- utilise various allocation and spreading techniques while performing top-down planning
- perform time series forecasting out-of-the-box for various popular methods (linear, moving average, weighted, auto-forecast)
- perform agile what-if simulations, scenario planning, and re-forecasting, in a visual and intuitive manner
- perform advanced variance analysis across your various data series (actuals, budgets, forecasts)
- visualise your business models and hierarchies with a fully customisable and advanced tree or table view for multiple measures and KPI.



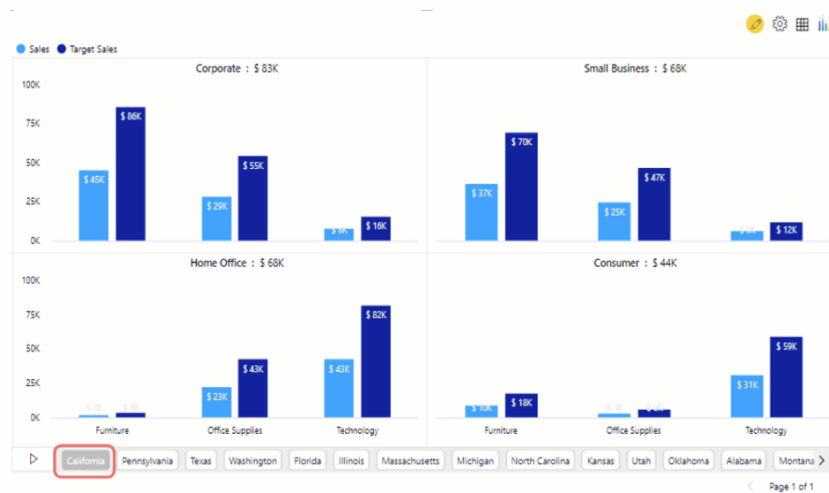
### Advanced Trellis by xViz

The xViz Advanced Trellis chart (also known as small multiples) is one of a group of similar charts having a common axis and value fields split across a category. For example, you can compare the same Product Sales across different countries, where each country is displayed in a separate chart. They are a great choice when it comes to analysing trends across a category in a single view.

The xViz Advanced Trellis provides different Trellis modes like Splitting the chart further by another category field, display stacked charts or display series animation options. End consumers can change the panel layout, toggle between different chart scale options (y axis) and perform ranking on the fly during runtime. You can scroll across different pages and expand any chart to full-screen mode to focus on it individually. Some of the other notable features are as follows:

- **Trellis Mode:** Chose between Splitting, Stacked charts and Animation options
- display Top N Values and group the remaining as 'Others'
- **pagination:** display multiple small trellis across different pages
- **average Panel:** display overall average across all panels or average values in a given panel
- 10+ different chart types with extensive customisation and styling options
- **Data Label customisation:** choose between different data label formats and column totals
- **utility menu:** change Panel layout and scale (y axis) on the fly
- **interaction:** enlarge Panels and interactive legends
- **axis label customisation:** rotate, word wrap, nth label and stepped labels to support long labels
- **advanced conditional formatting:** visually highlights outliers based on different rules
- **breadcrumb:** display for drilldown levels
- drill down support
- **number formatting:** enables customisation of values based on various business scenarios
- **summary table:** tabular view of data.

## Trellis Mode - Animated Charts



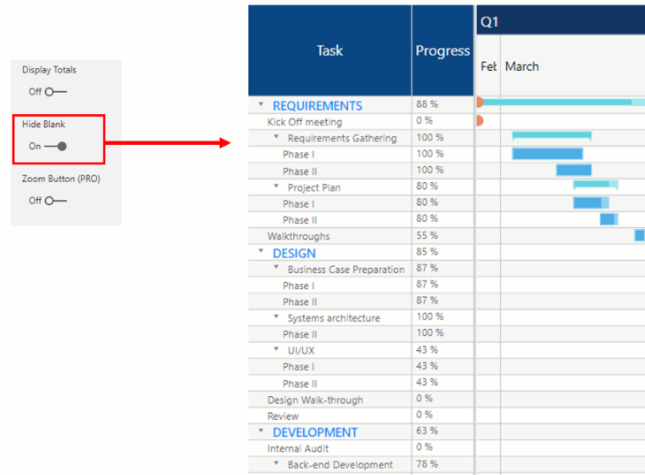
### Updates to Gantt chart by xViz

xViz has released a new Power BI certified version (1.1.6) of the Gantt chart with some new features, catering to a wide range of uses. The 'Advanced Editor' tab is updated to support multiple reference lines (e.g. today's date), and reference ranges highlight a time range. There are also additional milestone customisation options, hyperlink support and conditional formatting enhancements.

The xViz Gantt chart provides fiscal year support, ragged hierarchy support (hide blanks), aggregation for values in data grid and other additional features, listed below:

- support for Ragged hierarchies (filter blank)
- fiscal year support
- **number formatting:** aggregation for values in data grid (display measure)
- conditional formatting for Parent node
- conditional formatting enhancements for Progress Bar
- ability to set multiple reference Lines
- reference range
- hyperlink Support
- live editing and write back scenario
- multiple connector lines configuration
- **data label enhancements:** offset and padding options
- row numbering
- display totals
- date timeline formats
- language support for Power BI
- zoom levels (Advance Editor).

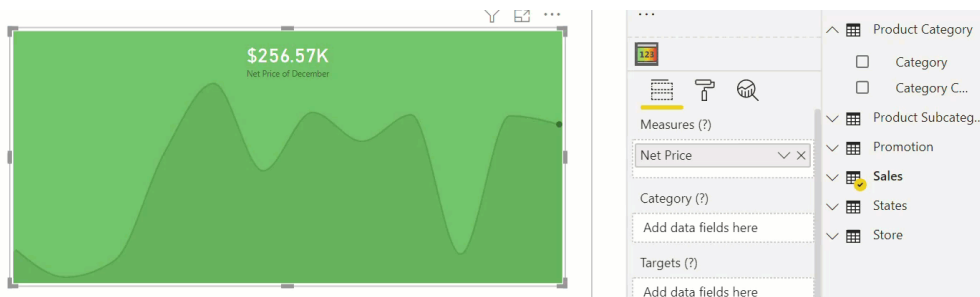
## Ragged Hierarchy Support (Hide Blank)



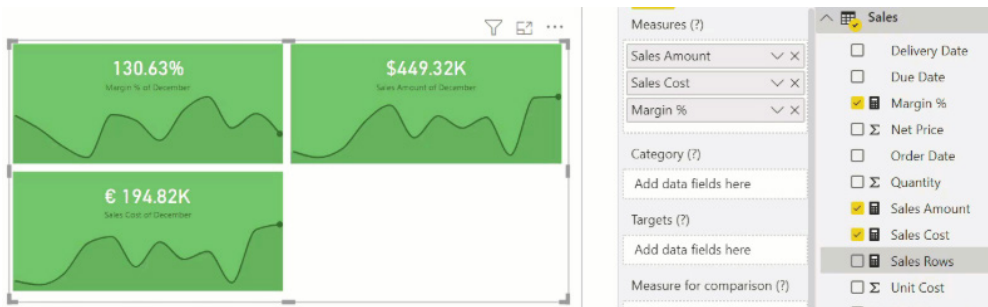
## Updates to Cards with States by OKViz

Card with States by OKViz is an enhanced version of the standard Card visual, which can include a sparkline and display the state of a measure. This free visual has already been widely adopted by Power BI users. Recently, they released the 1.6 version of Card with States, which introduces several new features to improve the productivity, the performance, and the layout of a report.

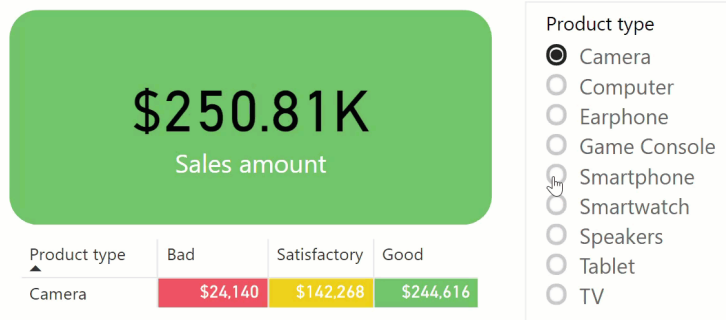
The premium features are free, so you can obtain your lifetime license just by registering to OKViz. The multiple cards automatically display multiple copies of the same card: one for each value in the category column.



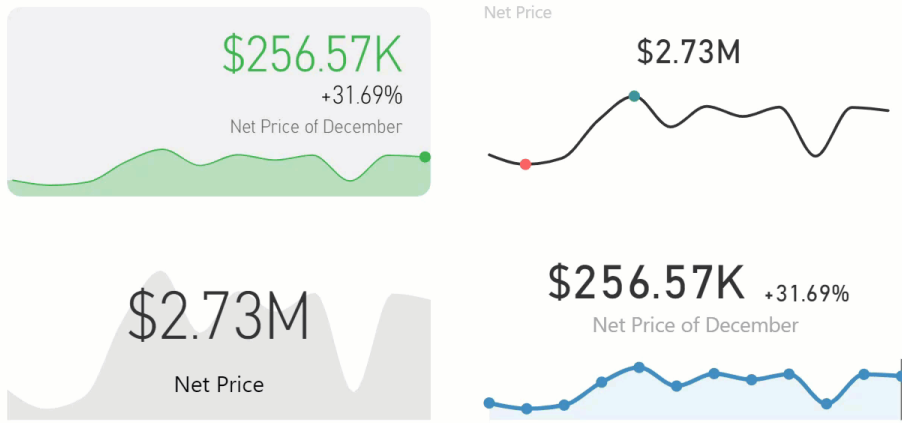
This feature makes it possible to display multiple measures in different cards by using a single visual.



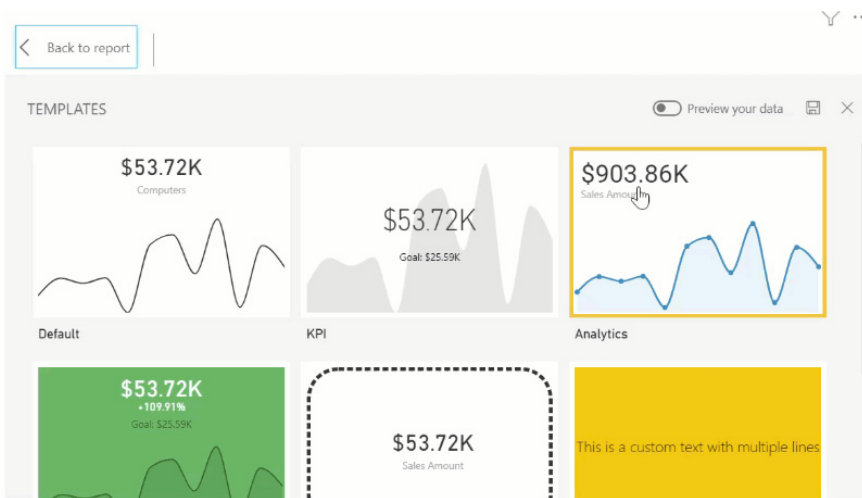
The state of a measure can be customised with a new, simplified user interface.



Each Card can show a trendline that now displays the value of the highlighted point dynamically.



Finally, you can quickly improve the presentation by choosing one of the layouts available in the template gallery, and you can also save your settings in new templates.



### Agile HR Analytics

Agile HR Analytics solution allows you to discover useful HR insights for strategic decision making. Using these dashboards, you can see your organisation's HR data from different perspectives, drill through from summary level to individuals, monitor diversity metrics, analyse absenteeism, understand your staff turnover, see your training effectiveness and analyse your historical data and future trends. It also

contains AI-enabled charts, such as Key Influencers, to show you the key factors that drive high performance explained by education, experience, and tenure.

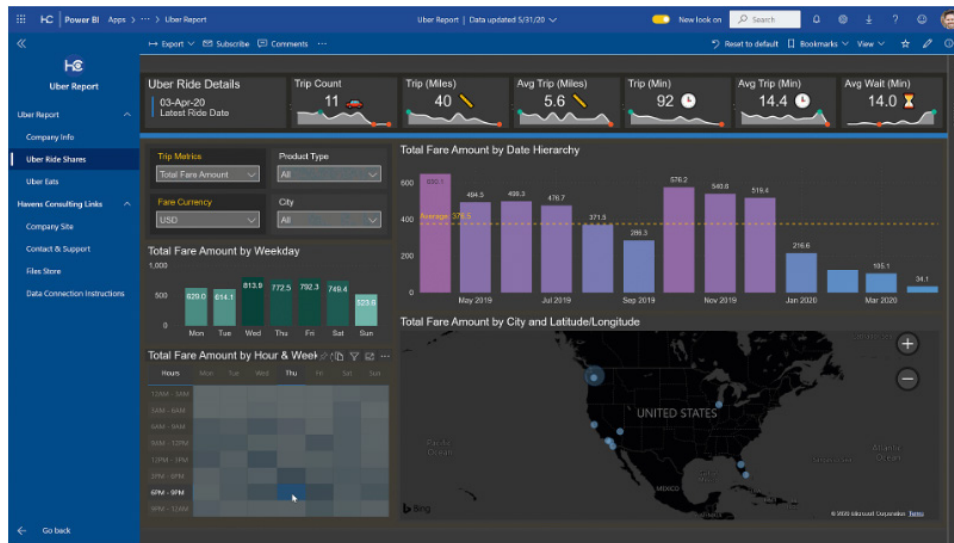
You can connect it to your HR data using provided templates, contact us for API options, or you can get the PBIX file and connect it to your data.



## Uber User Data Report

This Uber analytics report by Havens Consulting provides metrics and detailed information built off the last 12 months of your downloaded Uber user data, allowing for an in-depth analysis of your Uber rides and Uber eats deliveries. The report includes two pages of various

visuals focused on your user data: such as date and time information, geo location details, and dynamic metric selection for most visuals. The report also utilises the newer “dark mode” theme from Power BI.



To use this report, you must first download the user data from your Uber account. It can take up to 30 days for them to export your data, but commonly is within a week. To connect your downloaded user data in this template app, you will need to upload the user data to a SharePoint documents folder.

## Model view enabled for Live Connect (Preview)

When you live connect from Power BI Desktop to an Analysis Service model or a dataset published in the Power BI service, the Model view is now enabled. In the Model view, you can see a diagram of the remote model. In this view, you can create multiple layouts of the model, and view and modify report measures properties accordingly.

Please note that in this release you cannot make batch changes across multiple report measures while in live connect mode. This limitation will be mitigated in the coming releases.

This feature is on by default but is in Preview. You may go to the 'Report options' dialog to turn off this feature.

## Updates to Model view

This month Microsoft has provided several updates to the Model view. Here is the full list of updates:

- you can now resize the table containers from any side or corner
- dragging functionality has been changed. Previously, it was too easy to accidentally create hierarchies, so that functionality has been removed. If you want to create a hierarchy, you can right-click to create a hierarchy
- Previously, hierarchy levels were sorted alphabetically in the Model view. Now, this automatic alphabetical sorting has been omitted
- In earlier versions of Power BI, if you had a field with two colon characters or commas, the relationship arrow would not display or the diagram would grey out. This has now been fixed.

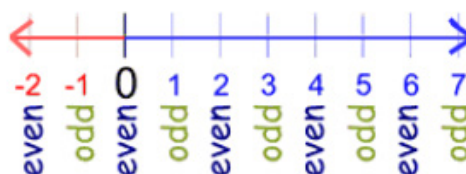
## Palantir Foundry connector

Palantir Foundry is a platform that works with how people use data, by removing the barriers between back-end data management and front-end data analysis. Foundry enables users with varying technical ability but with subject matter expertise to work meaningfully with data. Foundry allows you to source, connect and transform data into a given shape, and then use it to take action.

This connector will soon be available in the 'Online services' section of the 'Get data' dialog.

That's it for this month – more next month, we're sure!

## The A to Z of Excel Functions: EVEN



Don't get mad, get **EVEN**!

This function returns a **number** rounded up to the nearest even integer. You can use this function for processing items that come in twos. For example, a packing crate accepts rows of one or two items. The crate is full when the number of items, rounded up to the nearest two, matches the crate's capacity.

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

**EVEN(number)**

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

- **number**: this is required and represents the value to round.

It should be further noted that:

- if **number** is nonnumeric, **EVEN** returns the #VALUE! error value
- regardless of the sign of **number** (i.e. positive, zero or negative), a value is rounded up when adjusted away from zero. If **number** is an even integer, no rounding occurs.

Please see an example below:

	A	B	C
1	Formula	Description	Result
2	=EVEN(0.4)	Rounds 0.4 (away from zero) to the next even integer	2
3	=EVEN(3)	Rounds 3 (away from zero) to the next even integer	4
4	=EVEN(4)	Rounds 4 (away from zero) to the next even integer	4
5	=EVEN(-5)	Rounds -5 (away from zero) to the next even integer	-6
6			

## The A to Z of Excel Functions: EXACT

This function compares two text strings and returns **TRUE** if they are exactly the same, **FALSE** otherwise. **EXACT** is case-sensitive but ignores formatting differences. You should use **EXACT** to test text being entered into a document, for example.



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

**EXACT(text1, text2)**

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

- **text1**: this is required and represents the first text string
- **text2**: this is also required. This represents the second text string.

Please see the example below:

	A	B	C
1	Text 1	Text 2	
2	exact	exact	
3	Exact	exact	
4	eXact	exact	
5			
6			
7	Formula	Description	Result
8	=EXACT(A2,B2)	Checks whether the two text strings match precisely.	TRUE
9	=EXACT(A3,B3)	Checks whether the two text strings match precisely.	FALSE
10	=EXACT(A4,B4)	Checks whether the two text strings match precisely.	FALSE
11			

More Excel Functions next month...



## Beat the Boredom Suggested Solution

Earlier in the newsletter, we asked if you were given a series of numbers, and a target sum, could you get Excel to tell you which combination of numbers will result in the sum being achieved?

For example, with a target of 10 and the numbers:

Number
9
5
2
3
7
1

we should expect to see the results of 9 + 1, 7 + 3, 7 + 2 + 1 and 5 + 2 + 3 (in no particular order).

We did set some house rules:

- No macros / VBA
- No array (**CTRL + SHIFT + ENTER**) functions
- No Solver or other iterative tools (*i.e.* no circular references)
- Feel free to use Power Query if you think it will help.

How did you go with the task? We've come up with a solution that is 100% formula-based, that didn't even delve into Power Query.

The first task was to create a table with every combination of numbers that could be used. Given that we have six (6) numbers to choose from, there are  $6 + 15 + 20 + 15 + 6 + 1 = 63$  possible *different* results (from combination theory). Our results go down the page, so given the row limitation, this approach can work for a maximum of 20 numbers (with up to 20 choices), as that requires exactly 1,048,575 rows (conveniently one less than the number of rows in a spreadsheet, giving us room for the table header!).

If we have more input numbers than that, we can restrict the number of items in our combination. For example, looking at a list of 40 numbers but restricting the possible combinations of items to add to a maximum of five unique numbers would require 760,098 combinations to check – a lot, but well within the maximum capacity of Excel. Restricting the search to four number combinations would allow us to look through a list of up to 71 items before we run out of space.

Index1	Index2	Index3	Index4	Index5	Index6
1	0	0	0	0	0
2	0	0	0	0	0
2	1	0	0	0	0
3	0	0	0	0	0
3	1	0	0	0	0
3	2	0	0	0	0
3	2	1	0	0	0
4	0	0	0	0	0
4	1	0	0	0	0
4	2	0	0	0	0
4	2	1	0	0	0
4	3	0	0	0	0
4	3	1	0	0	0
4	3	2	0	0	0
4	3	2	1	0	0
5	0	0	0	0	0
5	1	0	0	0	0
5	2	0	0	0	0
5	2	1	0	0	0
5	3	0	0	0	0
5	3	1	0	0	0
5	3	2	0	0	0
5	3	2	1	0	0
5	4	0	0	0	0

Thus, the first step is to create a list of all the combinations. Once this is done, we can use an **INDEX** function to pick up the numbers that correspond to those combinations:

Unique1	Unique2	Unique3	Unique4	Unique5	Unique6
9	0	0	0	0	0
5	0	0	0	0	0
5	9	0	0	0	0
2	0	0	0	0	0
2	9	0	0	0	0
2	5	0	0	0	0
2	5	9	0	0	0
3	0	0	0	0	0
3	9	0	0	0	0
3	5	0	0	0	0
3	5	9	0	0	0
3	2	0	0	0	0
3	2	9	0	0	0
3	2	5	0	0	0
3	2	5	9	0	0
7	0	0	0	0	0
7	9	0	0	0	0
7	5	0	0	0	0
7	5	9	0	0	0
7	2	0	0	0	0
7	2	9	0	0	0
7	2	5	0	0	0
7	2	5	9	0	0
7	3	0	0	0	0

Totalling the values, we compare this back to our target number and set up a [1,0] flag to highlight any correct results. We also create a simple little rank using the **COUNTIF** function to see how many times the correct result was achieved prior to that combination:

Total	MatchTarget	Rank
9	0	0
5	0	0
14	0	0
2	0	0
11	0	0
7	0	0
16	0	0
3	0	0
12	0	0
8	0	0
17	0	0
5	0	0
14	0	0
10	1	1
19	0	0
7	0	0
16	0	0
12	0	0
21	0	0
9	0	0
18	0	0
14	0	0
23	0	0
10	1	2

From here, we can create a new index – starting from one (1), and looking up the corresponding values based upon the Rank column:

ResultIndex	Value1	Value2	Value3	Value4	Value5	Value6
1				3	7	
2			2		7	1
3		5	2	3		
4	9					1
5						
6						
7						
8						
9						
10						

This result shows us that, for the numbers we provided, there are four possible answers. However, if I change the target to 21, there are only two possible answers:

ResultIndex	Value1	Value2	Value3	Value4	Value5	Value6
1	9		2	3	7	
2	9	5			7	
3						
4						
5						

If we change the number of options to choose from, we can simply expand out the Index#, Unique# and Value# columns to include additional results, up to a maximum of 20 (since there are 2<sup>20</sup> rows in a spreadsheet). In the solution, we've included another example at 11 to demonstrate how it might work. With the new Dynamic Arrays

in Microsoft 365, you could actually set it up so that the columns would expand sideways dynamically, adapting automatically to your input table.

Until next time.

## Upcoming SumProduct Training Courses - COVID-19 update

Due to the COVID-19 pandemic that is currently spreading around the globe, we are suspending our in-person courses until further notice. However, to accommodate the new working-from-home dynamic, we are switching our public and in-house courses to an online delivery stream, presented via Microsoft Teams, with a live presenter running through the same course material, downloadable workbooks to complete the hands-on exercises during the training session, and a recording of the sessions for

your use within 1 month for you to refer back to in the event of technical difficulties. To assist with the pacing and flow of the course, we will also have a moderator who will help answer questions during the course.

If you're still not sure how this will work, please contact us at [training@sumproduct.com](mailto:training@sumproduct.com) and we'll be happy to walk you through the process.

Location	Course	Date	Date	Duration	Duration
Online (Australia)	Excel Tips and Tricks	6 Jul 2020	09:00-17:00 AEST	(-1 day) 23:00-07:00 GMT	1 Day
Online (Australia)	Financial Modelling	8 - 9 Jul 2020	09:00-17:00 AEST	(-1 day) 23:00-07:00 GMT	2 Days
Online (Australia)	Power Pivot, Power Query and Power BI	20 - 22 Jul 2020	09:00-17:00 AEST	(-1 day) 23:00-07:00 GMT	3 Days
Online (Australia)	Excel Tips and Tricks	18 Aug 2020	09:00-17:00 AEST	(-1 day) 23:00-07:00 GMT	1 Day
Online (Australia)	Financial Modelling	19 - 20 Aug 2020	09:00-17:00 AEST	(-1 day) 23:00-07:00 GMT	2 Days
Online (Australia)	Power Pivot, Power Query and Power BI	7 - 9 Sep 2020	09:00-17:00 AEST	(-1 day) 23:00-07:00 GMT	3 Days
Online (Australia)	Power Pivot, Power Query and Power BI	9 - 11 Nov 2020	09:00-17:00 AEDT	(-1 day) 22:00-07:00 GMT	3 Days
Online (Australia)	Excel Tips and Tricks	16 Nov 2020	09:00-17:00 AEDT	(-1 day) 22:00-07:00 GMT	1 Day
Online (Australia)	Financial Modelling	17 - 18 Nov 2020	09:00-17:00 AEDT	(-1 day) 22:00-07:00 GMT	2 Days
Online (Australia)	Power Pivot, Power Query and Power BI	14 - 16 Dec 2020	09:00-17:00 AEDT	(-1 day) 22:00-07:00 GMT	3 Days

## Key Strokes

Each newsletter, we'd like to introduce you to useful keystrokes you may or may not be aware of. This month, we thought we would put a **SHIFT** in and get more **CTRL** over our numbers. The days of these jokes are numbered...

Keystroke	What it does
CTRL + SHIFT + 0	Show column(s)
CTRL + SHIFT + 1	Fixed decimal and comma format
CTRL + SHIFT + 2	Time (AM / PM format)
CTRL + SHIFT + 3	Date format
CTRL + SHIFT + 4	Currency format
CTRL + SHIFT + 5	Percentage format
CTRL + SHIFT + 6	Exponential format
CTRL + SHIFT + 7	Outline border
CTRL + SHIFT + 8	Select current region
CTRL + SHIFT + 9	Unhide row(s)

There are c.550 keyboard shortcuts in Excel. For a comprehensive list, please download our Excel file at [www.sumproduct.com/thought/keyboard-shortcuts](http://www.sumproduct.com/thought/keyboard-shortcuts). Also, check out our new daily **Excel Tip of the Day** feature on the [www.sumproduct.com](http://www.sumproduct.com) homepage.

## Our Services

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

- **Business planning**
- **Building three-way integrated financial statement projections**
- **Independent expert reviews**
- **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](mailto: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".

If you have received a forwarded newsletter and would like to receive future editions automatically, please subscribe by completing our newsletter registration process found at the foot of any [www.sumproduct.com](http://www.sumproduct.com) web page.

## 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](mailto: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.

Check out our more popular courses in our training brochure:



Drop us a line at [training@sumproduct.com](mailto:training@sumproduct.com) for a copy of the brochure or download it directly from <http://www.sumproduct.com/training>.

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