It's finally happened!!

Microsoft has woken up and smelt the coffee. Power Pivot is to become available for all. This is **B-I-G** news.

Normally, I'd say that's all you need to know for this month, but there is sad news to report too as Excel loses one of its nearest and dearest, 16-times MVP Chip Pearson.

With this and the usual news, tips and updates, it's another bumper issue.

Until next month.

Liam Bastick, Managing Director, SumProduct

Power (Pivot) to the People

Excel Program Manager **Ashvini Sharma** has just announced on User Voice something we have all been dying to hear. It has just been announced that Power Pivot is to be made available in <u>all</u> Windows editions ("SKUs") of Excel! This means the Business, Home, Standard, ... editions - *i.e.* the one you have!! This is fantastic news and opens up the benefits of this revolutionary add-in to all.

This change has started rolling out with the April Current Channel updates (Builds 9330 and beyond). And yes, it will also be in the upcoming 2019 version as well. This is brilliant news!!

You have no excuse now to stop wasting so much time on preparing data when efforts could be better spent on analysing it and taking appropriate action in a timely fashion. Please take the time to understand what Power Pivot, Power Query / Get & Transform and Power BI can do for you. A little bit of investment can go a long, long way. You can find out more here: www.sumproduct.com/courses/power-pivot-power-query-and-power-bi.

General Data Protection Regulation (GDPR)

The European privacy law, the General Data Protection Regulation (GDPR), went into effect last month (May 2018). This can have further effects on all of your spreadsheets (e.g. Sarbanes-Oxley reporting requirements), but there's consequences for those of you working with Power BI too. Consequently, Microsoft has released the Power BI GDPR Whitepaper. This paper provides high-level guidance on the different options you have in configuring Power BI to meet the requirements of this law across your organisation. You can download this document (and many others!) for free: click here.

Feel free to drop us a line at contact@sumproduct.com should you have any questions.

Microsoft Flow and Excel

Microsoft Flow is a Cloud-based software tool that allows employees to create and automate workflows across multiple applications and services without the need for developer help. Automated workflows are called *flows*. To create a flow, you simply specify what action should take place when a specific event occurs.

The most common use of Flow is to trigger notifications. For example, when a new file is added to Dropbox or OneDrive, an automated workflow can instantly post a copy of the file to SharePoint. Flows can also be used to collect data. For instance, if the user wants to see what people are saying about a particular brand, he or she can create a trigger that will capture new tweets that mention the brand and put a copy of each tweet in an SQL database for sentiment mining.

Once a flow is built, it can be managed on the desktop or through an app on a mobile device. Flow integrates with various Microsoft services, including PowerApps, Dynamics 365 and Office 365. In particular, it has now been integrated with Excel.
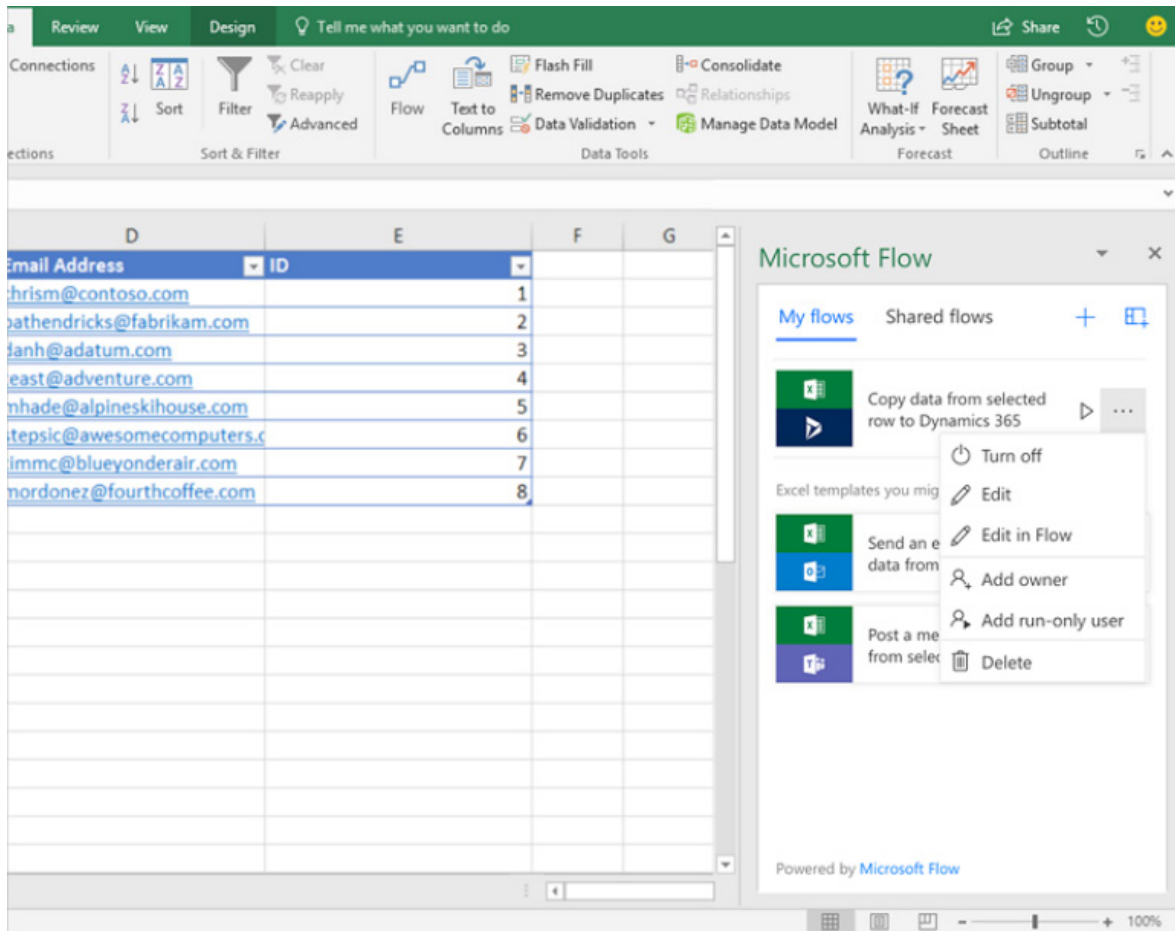
With this integration, users may create, manage, and most importantly run automated workflows on Excel tabular data. Via Flow, users will be able to send data from their spreadsheets hosted in SharePoint and OneDrive for Business to a wide range of services such as Teams, Dynamics 365, Visual Studio Online, Twitter, *etc*. The integration will first be shipped as an add-in in the Office Store and will become an in-the-box component later this year.

RIP Chip Pearson

Sad news this month. Too late to publish in our last newsletter, we have learned Excel legend **Charles "Chip" H. Pearson**, 16 times an Excel MVP (no mean feat), died on April 19, 2018, from severe head injuries received in a car accident earlier that month, in Kansas City MO. He was 51. Chip founded Radial Velocity Computing and Pearson Software Consulting LLC, and was an inspiration to a generation of would-be spreadsheeters and programmers, ourselves included.

He shall be missed.

UPDATE: We have also learned that former Excel MVP Greg Truby, who is also from Kansas City, has liaised with Chip's family and hosting company to get the website www.cpearson.com back up online. If you haven't ever visited it, we do suggest checking it out. There are over 250 downloadable files, including sample workbooks, VBA modules and compiled DLL files.

Amsterdam Excel Summit

The fifth annual Amsterdam Excel Summit is almost upon us. As mentioned previously:

- SumProduct's own Liam Bastick will be presenting
- The date of the summit is **June 7**
- There will be a post-conference Masterclass on **June 8**
- The event will be held in, er, Amsterdam!

You can find out more regarding the agenda, venue and how to book at https://topexcelclass.com/index.php/amsterdam-excel-summit/.

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 combining data from tables in several worksheets.

This month's example workbook contains three worksheets. Each of the worksheets has been populated with a table of expenses information:
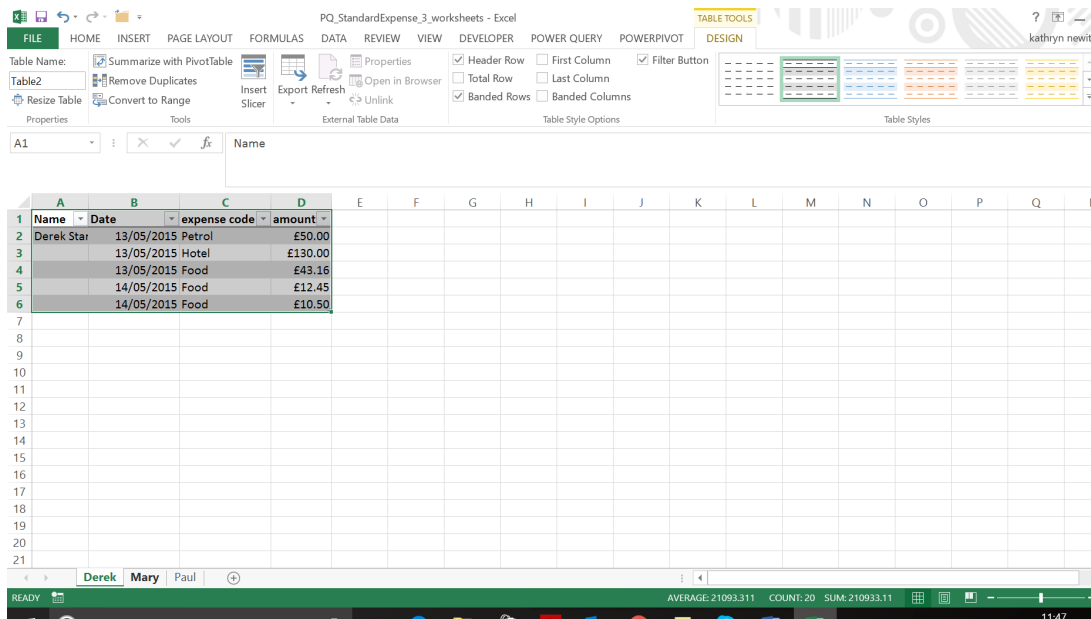

The initial process in order to start getting data from these worksheets is to go to the 'POWER QUERY' tab (Excel 2010 or 2013, 'Get & Transform' in the 'Data' tab in Excel 2016) and create a new blank query, as shown below:
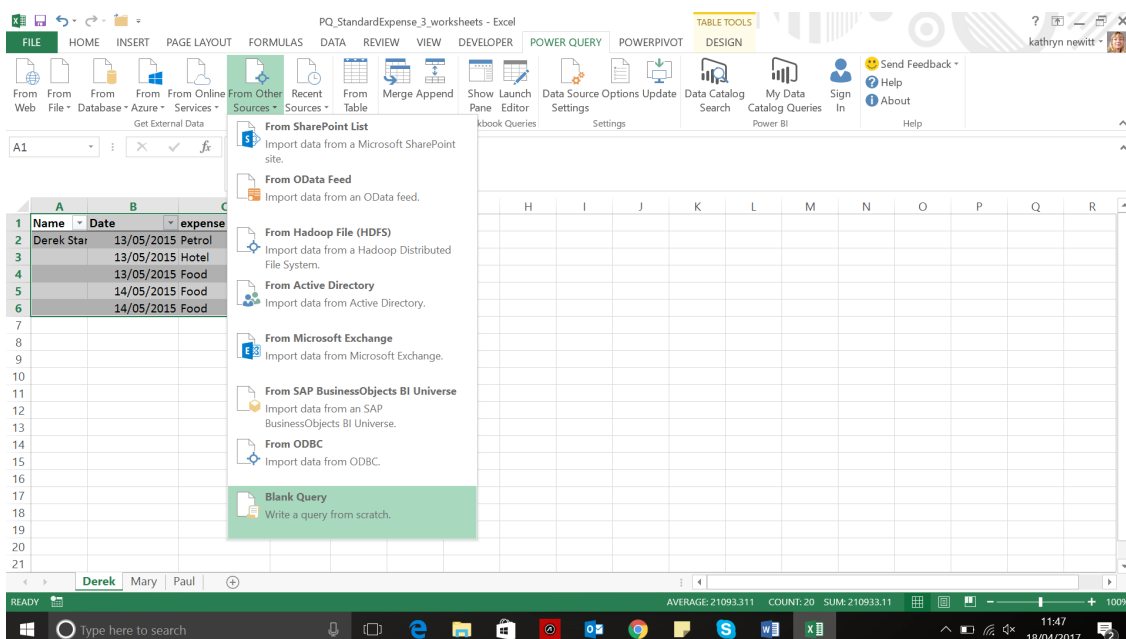
In the Power Query Editor, in the formula bar at the top of the screen, enter the following formula:

=Excel.CurrentWorkbook()

which will list tables (and would list named ranges and workbook connections) that we have in our workbook as follows:
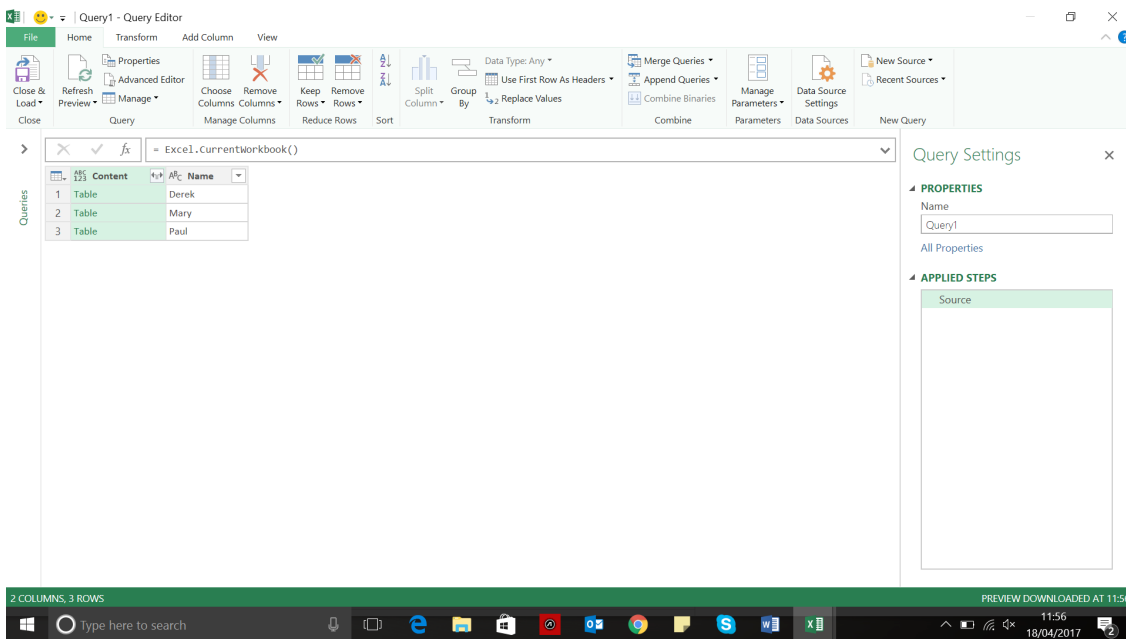

To keep it simple, the table names here are the same as the worksheet names (note that this function will not extract data that is not in a table or named range). At this point, if we had other ranges or tables that we wanted to exclude from my query we could apply filters. The tables listed would include any connections from the workbook, and so this filter will be useful later. For now, we want all of the data, so the next step is to look at what the 'Expand' option next to the **Content** column title does:
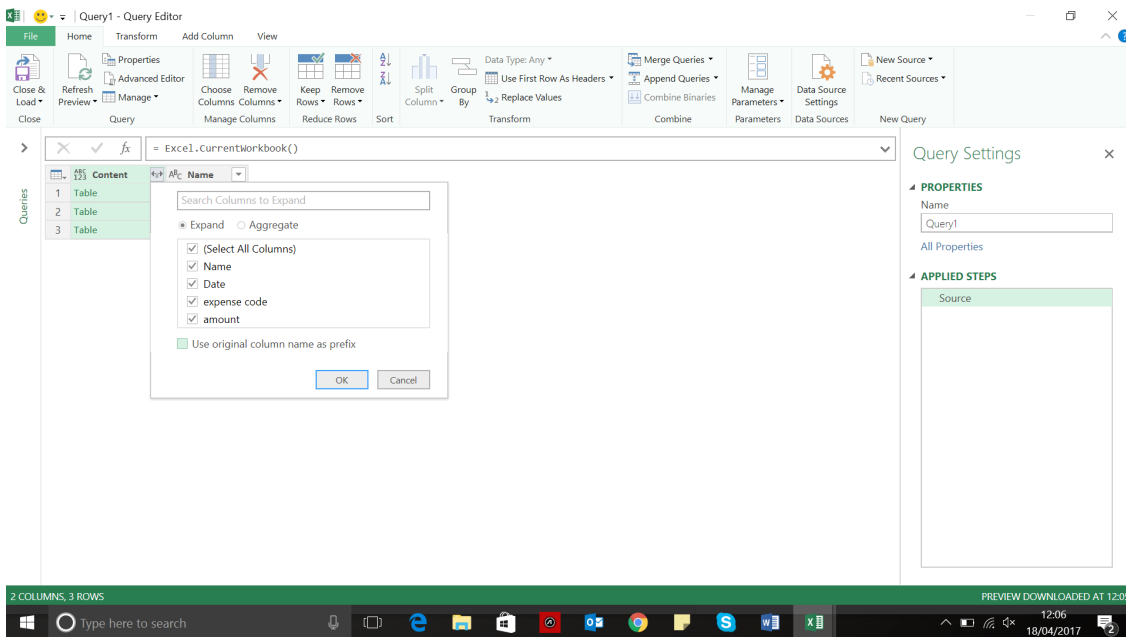

We are given the option of selecting all of the columns from my tables. We don't need to use the original column name as a prefix, so let's uncheck that option. (There is also an option to 'Aggregate' instead of 'Expand', which is not appropriate for this month's example but this does deserve a blog entry of its own.) Let's choose to expand the data thus:
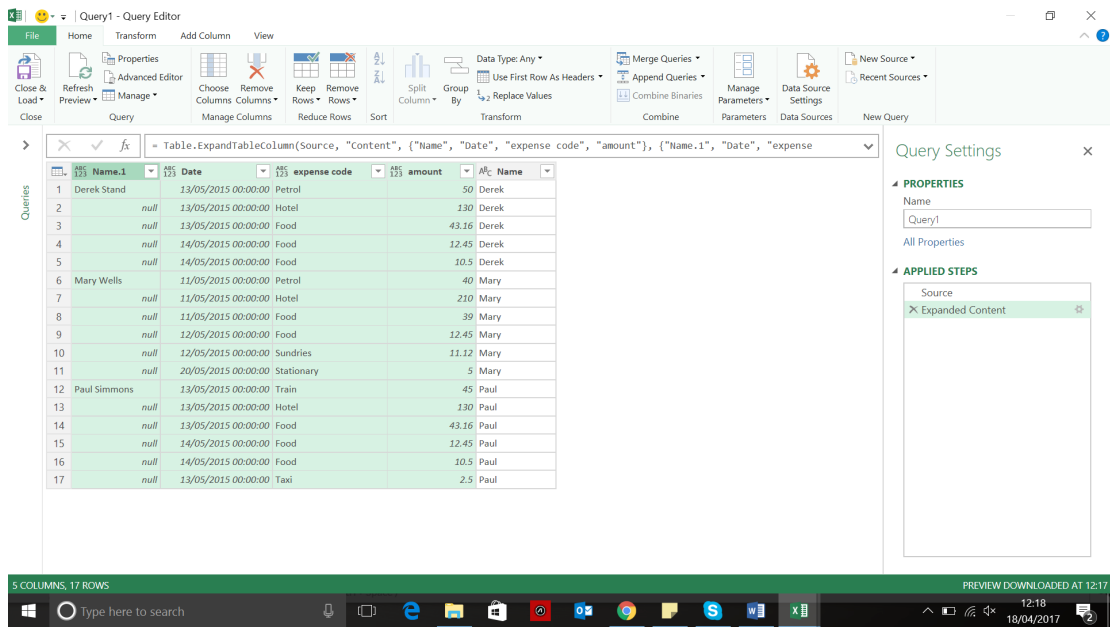
Now this data looks ready to load, so that's what we will try next. All seems well to begin with, until we scroll down and find some unexpected data:
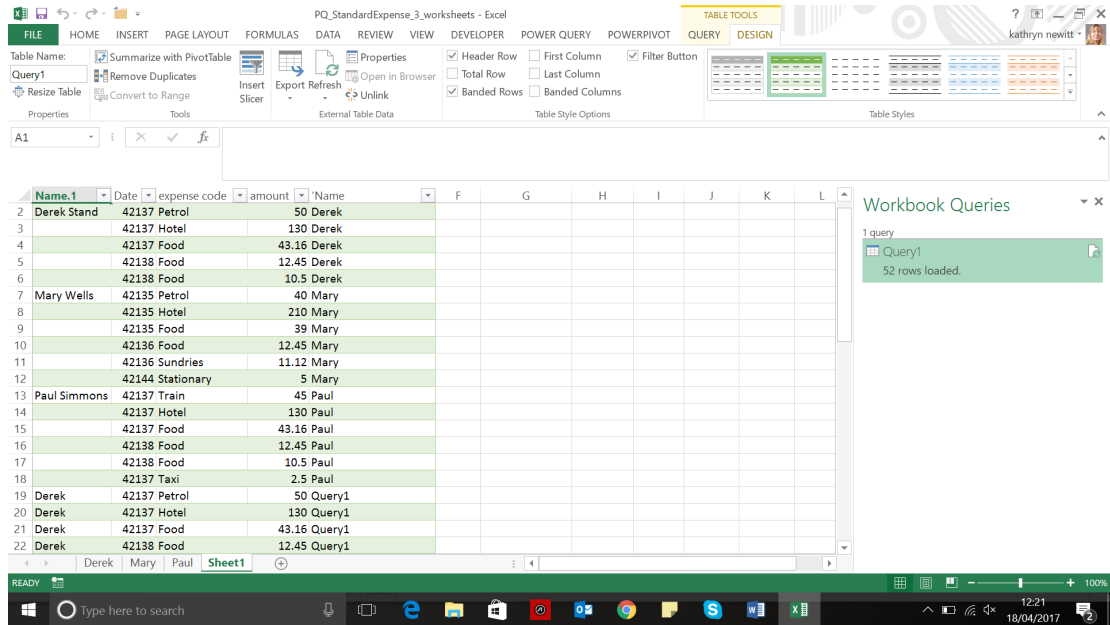

In order to see where this has come from, let's go back to our query and check out the source step.
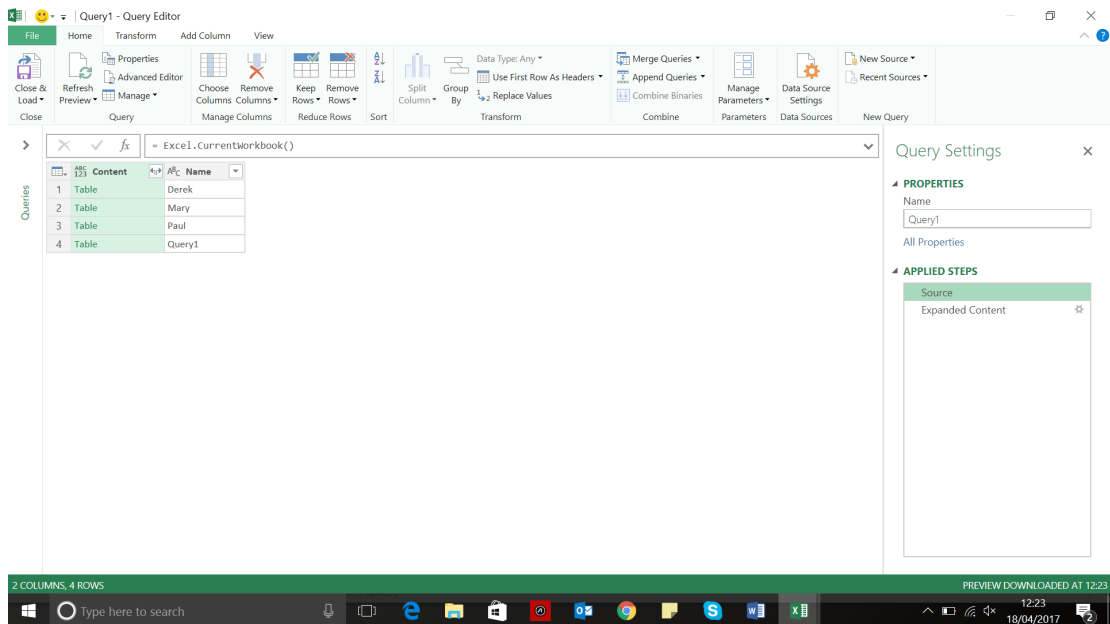
The query is a connection from the workbook, so it is included in the list of tables! Clearly, this is confusing my output, so we need to get rid of it from the source step. We can filter at this point and remove everything with the name 'Query1', but we will have to revise this if we change the name of my query. To show what this means, rename the query to 'Expenses' and review the options available in the filter of the 'Source' step:
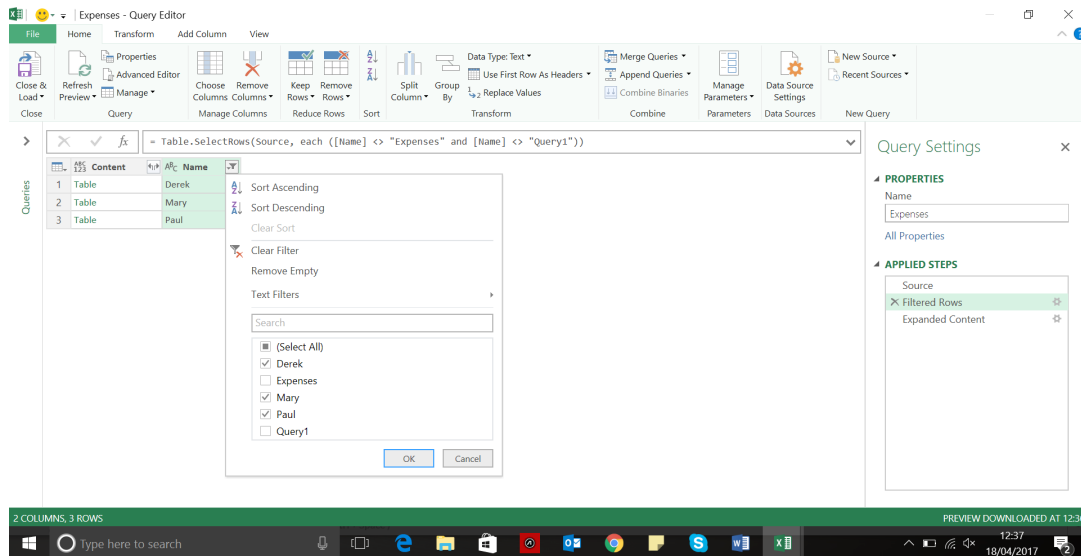
Filter out the **Query1** and **Expenses** tables, and we are left with the expense data which can be uploaded:
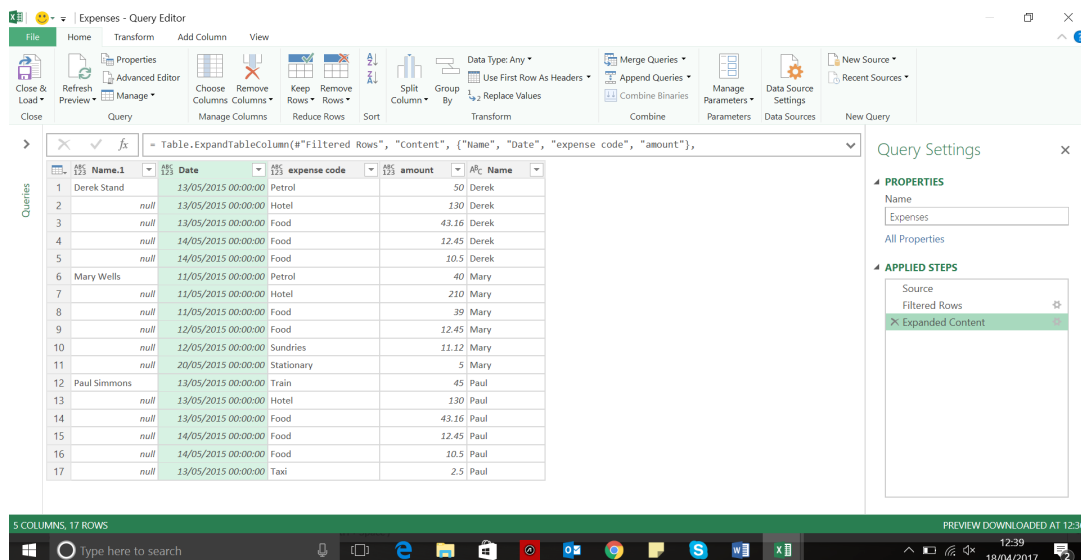
Having chosen which **Name** column to keep, the data appears on a separate worksheet to the other tables:
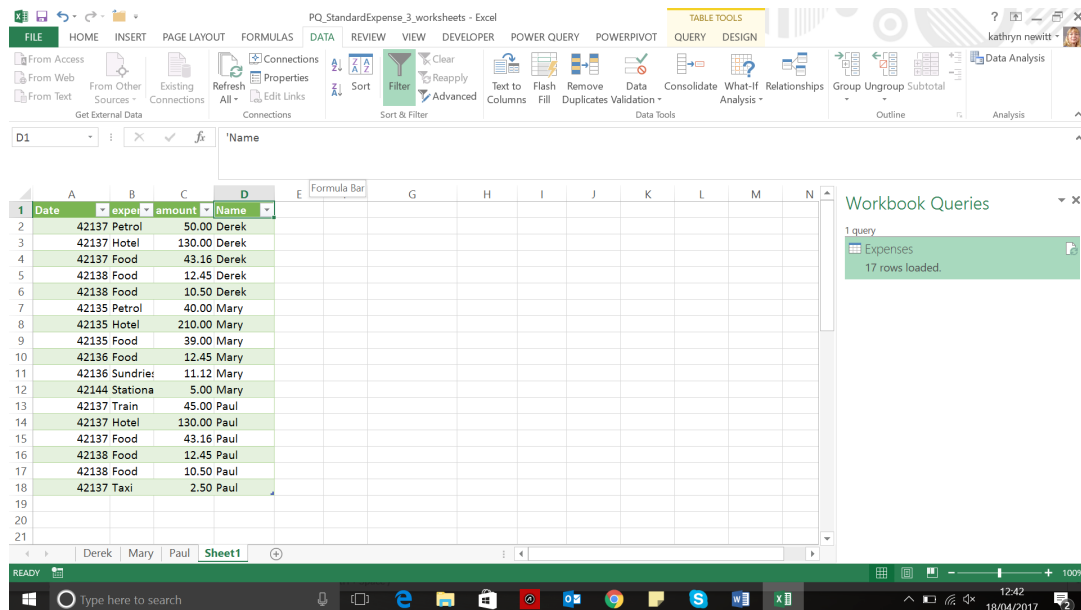
And so, we have our complete expenses list, with rather less rows uploaded this time. Next time we'll have a look at how to pull in data from worksheets in other workbooks…

May Updates for Power BI Desktop

Another month, another list. Not that we are complaining! Microsoft has just released its latest Power BI Desktop updates. This time out, drill through and conditional formatting seem to have had the greatest overhaul, whilst there's also changes to one of our favourites, Add Column From Examples.

The full list for May is as follows:

Reporting

- Conditional formatting by a different field
- Advanced slicer synchronising
- Log axis improvements
- Data label options for funnel chart
- Set line stroke width to zero

Analytics

- Measure drillthrough

Power BI Premium

- Incremental refresh (Preview)

Custom visuals

- Collage by CloudScope
- Chinese Color Map

Data connectivity

- New "From Web" connector: by example data extraction (Preview)
- Common Data Service for Apps connector (Beta)
- Azure KustoDB connector (Beta)
- Google BigQuery and Azure HDInsight Spark connectors now Generally Available (GA)
- Adobe Analytics connector update: support for multiple domain logins (Preview)
- Visual Studio Team Services connector update: analytics views support
- OLE DB connector update: support for alternate Windows credentials
- SAP BW DirectQuery connector update: improved technical name support

Data preparation

- Improvements to Add Column From Examples.

Let's take a look at each of these in turn.

Conditional formatting by a different field

This month begin s with a significant improvement in conditional formatting, *i.e.* the ability to formatting a column by a different field in your model.

From this update, whenever you open the conditional formatting dialog, you'll see two new dropdowns. The first, 'Color based on', is where you may pick which field from your model the conditional formatting rules should be based upon, and the second, 'Summarization' *(sic)*, is where you'll pick the aggregation type for that field. There is also an 'Apply color to box' that allows you to know which field in your table or matrix is being formatted currently.
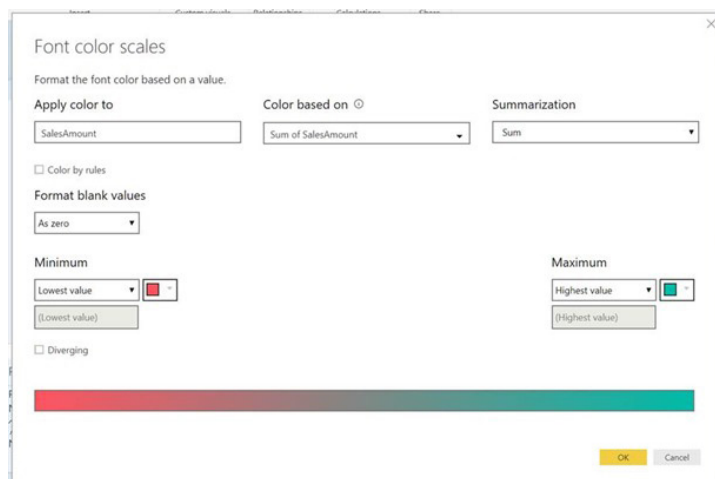
The field and summarisation type to colour by are auto-populated with the same column that's in your table you've chosen to format, so you won't have to do any extra configurations unless you want to customise it. When you do customise the field for the colour to be based on, you'll get a similar experience to the field list where you can expand and collapse tables in your model and search to help you find the field you're looking for.
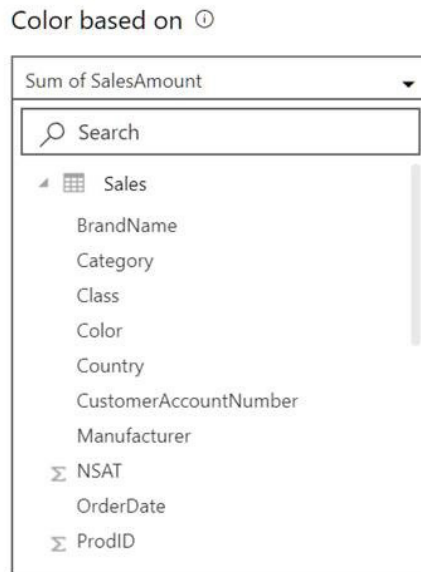
In the below example, the example displays total sales by product and is colouring that column by the average net satisfaction of the product:
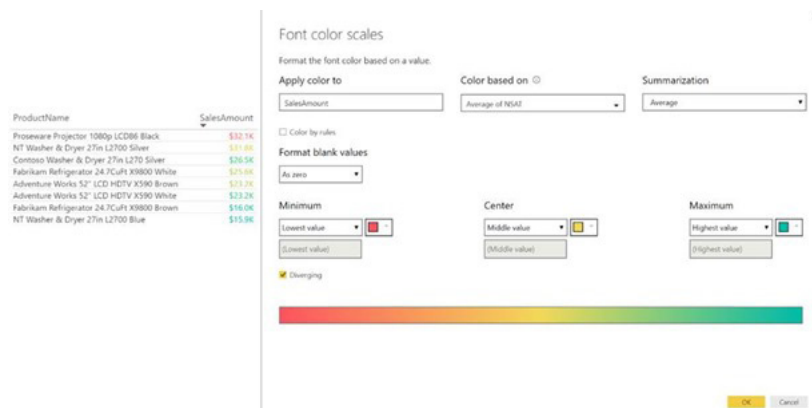
You can also pick a new source of formatting when using the 'Color by' rules version of conditional formatting. This update also opens up conditional formatting to text and date fields as well, as long as you choose a numeric value to format on. This has been a common request from our clients and is sure to be a welcome addition to the conditional formatting Power BI family.
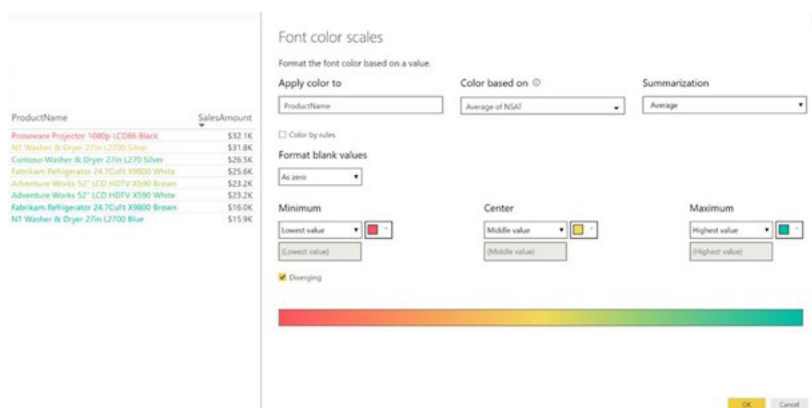
For example, a common use case for this would be to create a measure in your model that does your custom business logic, such as comparing target vs. actuals and the use 'Color by' rules to format the text based on the result. One instance might be to create a measure to return a -1, 0 or 1 if a product is under, at, or above its sales expectations, and then in 'Color by' rules mode choose to format the product name red if the measure returns -1, yellow if it returns 0 and green if it returns 1.

Advanced slicer synchronising

There's now an 'Advanced' section on the 'Slicer syncing' pane that allows you to create custom groups of slicers to synchronise ("sync"). By default, synced slicers will be put a group with a name that matches the field used in the slicer, but you may override this with any name you want. This means you can create separate groups to sync slicers that use the same field. For example, you may have two slicers using the same field on the same page, and you want to sync one of them with a slicer on another page.

You can also put slicers that use different fields in the same group. For example, you have two different date fields and you want to have the selected date sync between the slicers. If the value selected in the first slicer doesn't exist in the second slicer, you'll see it appear at the bottom of the list of values.
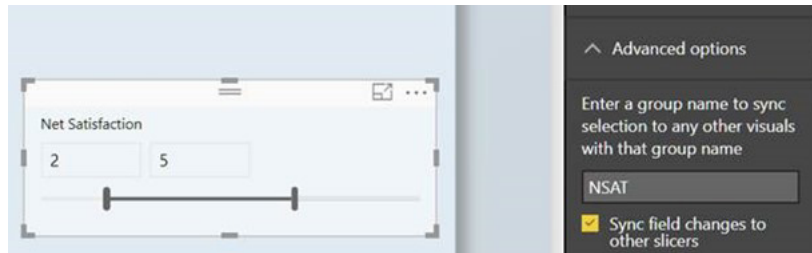

You can also check the 'Sync field changes to other slicers' option. With this option checked, if you swap the field used in the slicer, all the synced slicers will update to use the same field.

Log axis improvements

Whilst Microsoft has supported the log axis for a very long time, the support has been inconsistent across charts and could sometimes be hard to use. Therefore, changes have been made.

You may now select log scale for the numeric axis of any cartesian chart, including combo chart, when you have data that is completely positive or completely negative. Reference lines should also observe the log scale and will cause the scale to resize to accommodate them.
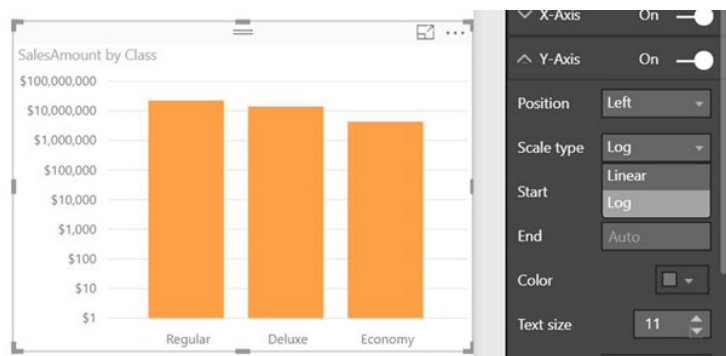
If you have data that crosses zero, you'll now get a helpful warning in the property pane, and the scale type will revert to linear. Once your data is updated to no longer include both positive and negative values, the visual will start to use the log axis again.
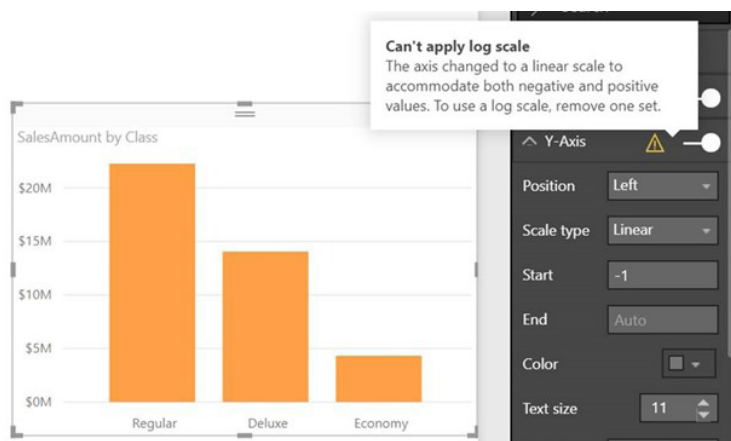
Data label options for funnel chart

This update also provides more control for data labels in funnel charts. You may now pick if each bar shows the actual value, the percentage of the first bar, the percentage of the previous bar or the actual value and one of the two percentage options.
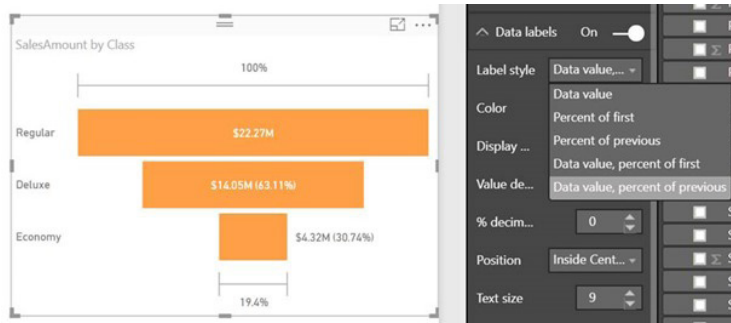
It should be emphasised that the first bar will always show only the data value since the percentages are always 100%.

Set line stroke width to zero

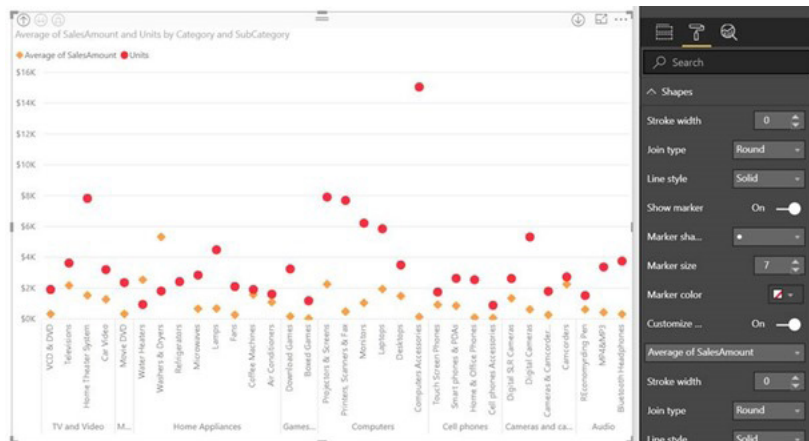It's not only funnel charts that have been updated. Another small formatting is the new ability to set the stroke width of lines to zero.

This works for combination (combo) charts as well as line charts, *viz*.
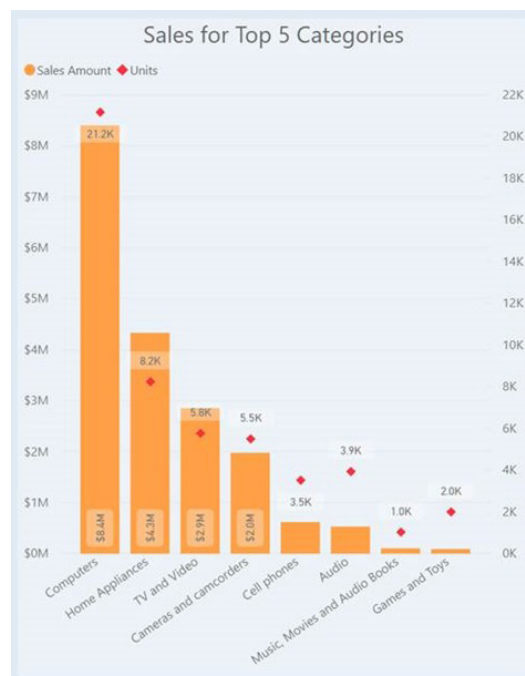
Measure drillthrough

Back in September, Microsoft released a drillthrough experience that allowed you to move from one page to another carrying specified filters through. This could be set up by creating your drillthrough page (*i.e.* the page you want to land on) and then adding any categorical fields to the Drillthrough filters bucket in the filter pane as required.
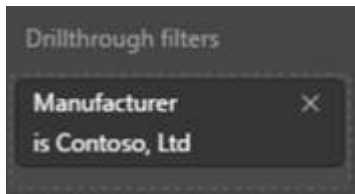
Any fields you put in this bucket would be tied to this page. Any chart in the rest of the report that used that field could be right-clicked on to move to the drillthrough page. This was a useful feature, but was limited to only filters on the fields explicitly placed in the 'Drillthrough filters' bucket. There was no way to carry the entire filter context of your data point through the drillthrough page.

This update allows you to carry all filters through. When you are setting up your drillthrough page, if you want all filters to pass through and not just the fields placed in the bucket, you can turn the 'Pass all filters' toggle on:
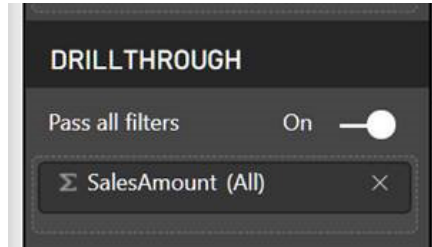
Once the toggle is on, whenever you right click on a data point and drillthrough, all filter context from the source page is passed to the drillthrough page. Users will be able to see a restatement of all these filters in the 'Drillthrough' bucket.
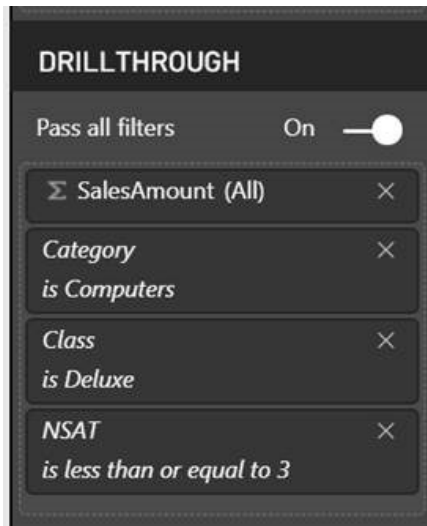
With the toggled turned off, only filters on the columns specified will be carried through.

With this drillthrough update, you can now use measures and summarised numeric columns in the 'Drillthrough' bucket. You can pick if you want to allow drillthrough on numeric columns when used as a category (*e.g.* a chart showing number of reviews by rating) or summarised (*e.g.* a chart showing average rating by category).
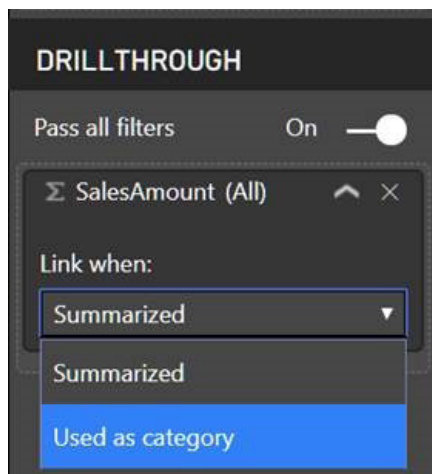
The 'Pass all filters' option is on by default for new drillthrough pages and off by default for existing pages. You'll also see this new experience for the report page tooltip.

Power BI Premium: Incremental Refresh (Preview)

Incremental refresh will unlock very large datasets in Power BI Premium. You can define the refresh policy in Power BI Desktop to determine how data is incrementally refreshed when published to the Power BI service. Refreshes are faster, more efficient and more reliable because only the new data needs to be refreshed.

To leverage incremental refresh in the Power BI service, filtering needs to be performed using Power Query date / time parameters with the reserved names *RangeStart* and *RangeEnd*.
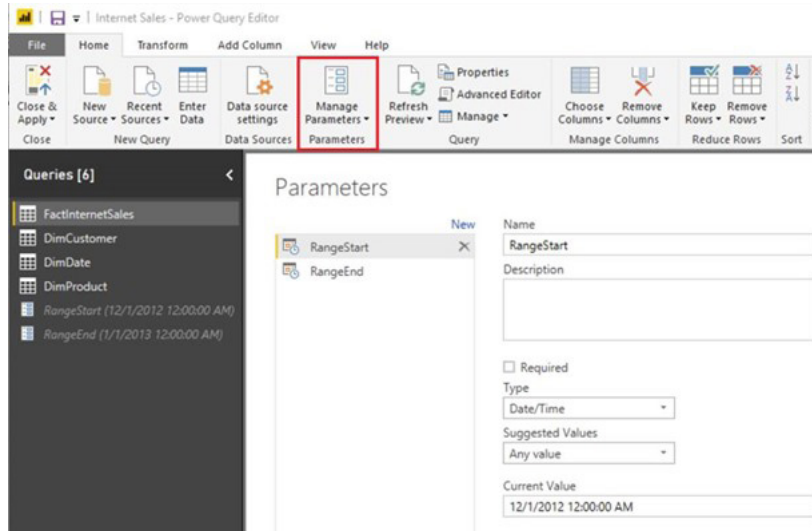
With the parameters defined, you can apply the filter by selecting the 'Custom Filter…' menu option for a column:
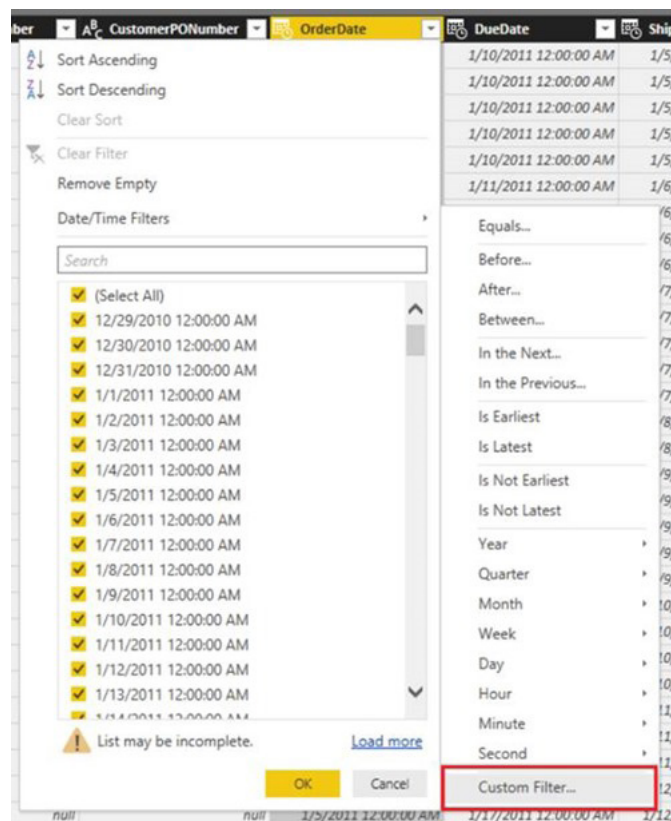
You should then ensure rows are filtered where the column value is after or equal to *RangeStart* and before *RangeEnd*.
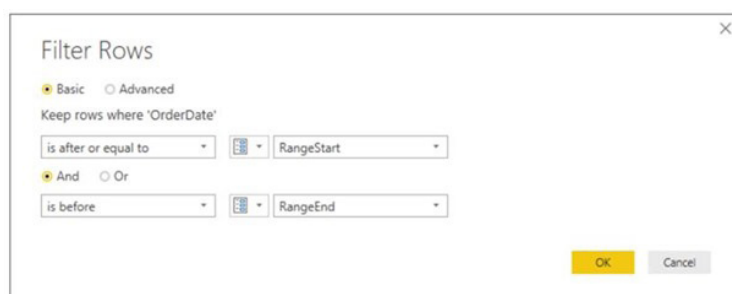
Once this is set up, you can 'Close and Apply' the Power Query Editor. You can then set up your refresh policy by right clicking on the table and selecting 'Incremental Refresh'.
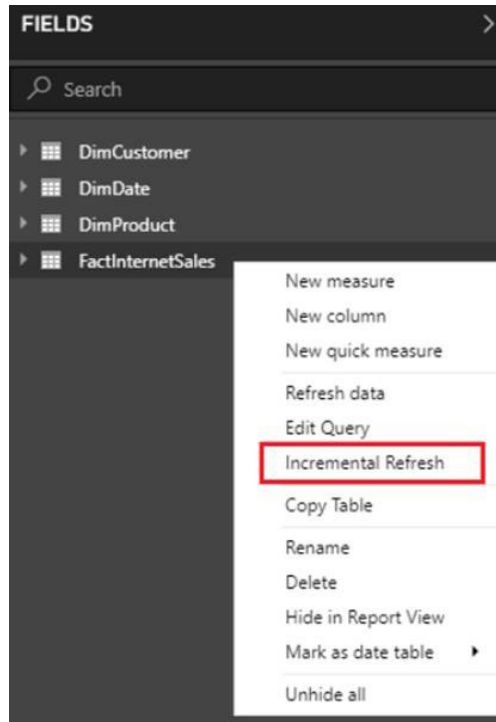
The incremental refresh dialog includes several options:

- how long to store data for
- the length of time to refresh data for
- if the data should refresh only on data changes based on a date / time column in your data
- if only completed periods should refresh.
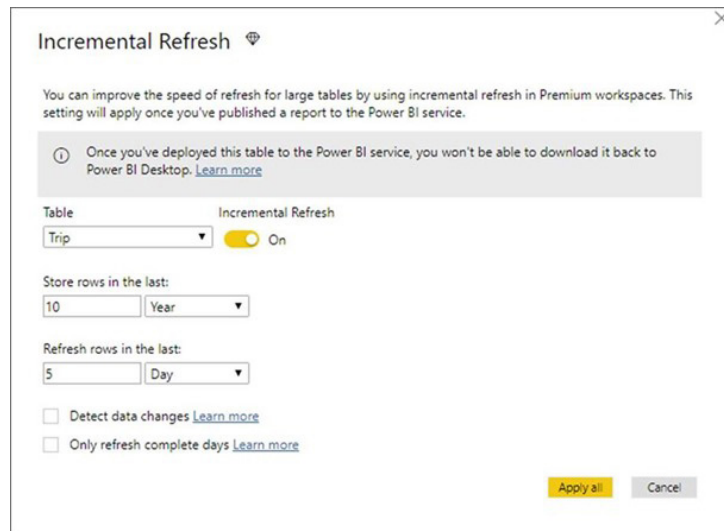
This is a preview feature, so you will need to enable it under **File > Options and Settings > Options > Preview features**. This feature is a Premium feature currently, so it will only work if you publish to a premium workspace. It is our understanding that eventually this feature will be enabled for Pro users as well, but for now, it is limited to Premium only.

There are some things to be aware of when using incremental refresh:

- once you set up incremental refresh, it will not be possible to download your **.pbix** from the Power BI service
- your first refresh may take a little longer while we load the historical data, but subsequent refreshes will be much faster
- since re-publishing reports overwrites the entire dataset, you will need to reload the historical data again on the next refresh after it has been re-published.

Collage by CloudScope

The Collage by CloudScope custom visual displays images in either a compact grid display or a larger detail view in a style similar to Instagram. In addition to displaying an image from an image URL, you may optionally display any of the following field types:

- author name
- author profile image
- caption
- caption sentiment
- comment count
- like count
- media date
- media type
- permalink
- video URL.

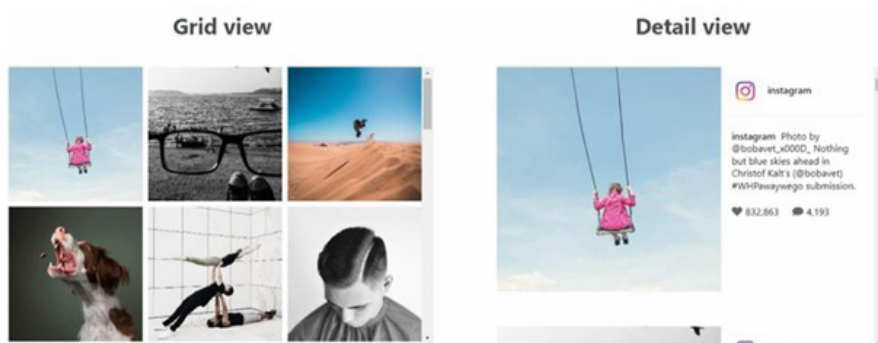In addition, you can provide any generic data fields and the visual will automatically be formatted in the familiar Instagram style for numbers and dates.

Chinese Color Map

If you are using geographical data for China, you might want to try out the Chinese Color Map custom visual. This map has several features:

- arbitrarily set the latitude and longitude of the area you want to display
- gradient fill for regions on the map
- offline maps
- one-click switching between a national China map and provincial maps
- rich visual formatting including shading, colours and patterns.
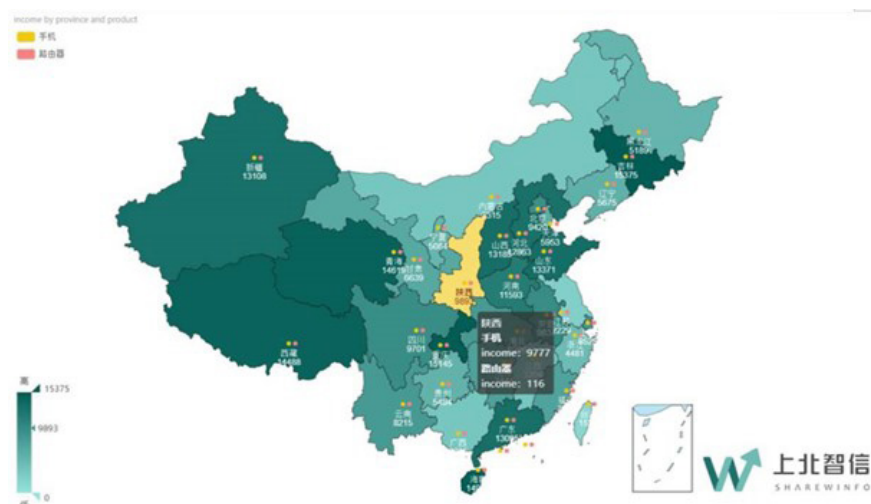
New "From Web" connector: by example data extraction (Preview)

One of the most used connectors in Power Query is the 'From Web' connector. This connector allows you to easily scrape data from HTML tables and import them into Power BI Desktop. With this release, this connector is now enhanced by allowing any HTML data, not just tables, to be extracted. To do so, you can provide a few samples for the data that you want to extract, and Power Query will apply smart detection algorithms on top of the HTML page content to identify the entire set of rows to generate.

To try out this feature you need to enable it under the 'Preview Features' tab in the 'Options' dialog.
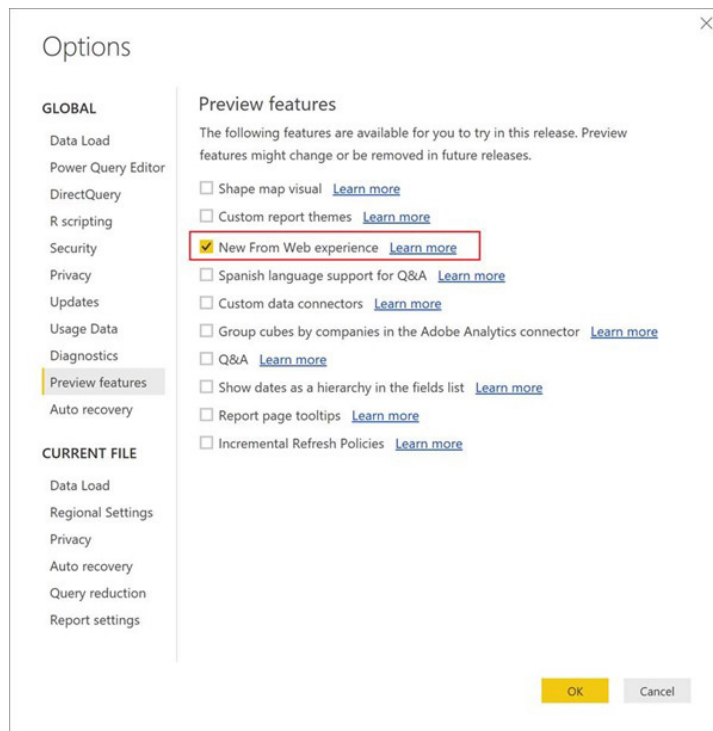
After enabling it, you can find the 'Web' connector within the 'Other' category in the 'Get Data' dialog.
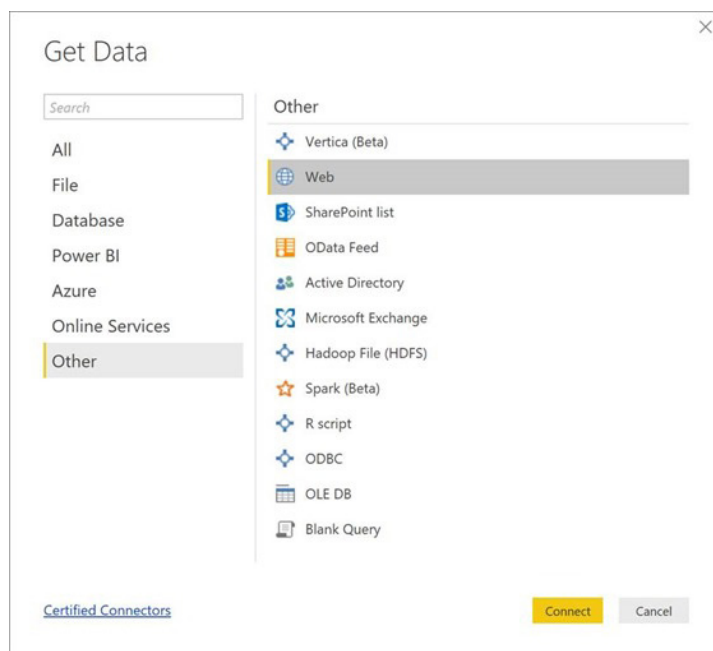
You can specify the URL of the webpage from which you want to extract data. For example, Microsoft is desperate for you to try https://www.microsoft.com/en-us/store/top-paid/games/xbox?category=classics.
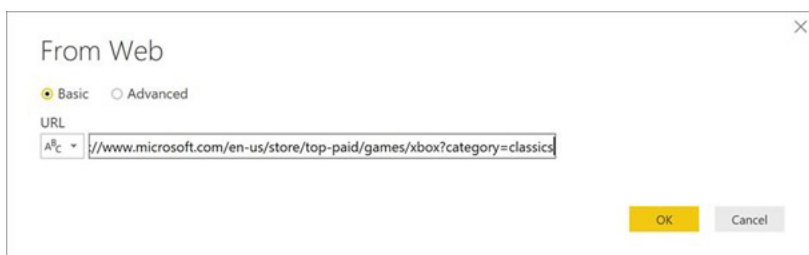
After clicking 'OK', you will be taken to the 'Navigator' dialog where you would see a number of auto-detected tables (HTML tables). In this case, none of them were found since the data in this webpage is not exposed as HTML tables. With the new Web By Example enhancements, you can now access the "Extract table using examples" button in this dialog.
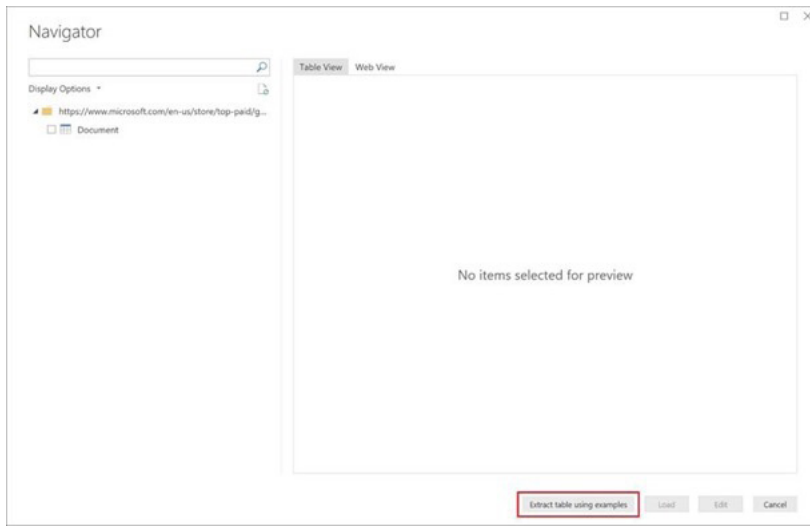
This option brings you into an interactive experience where you can preview content in this page and specify sample values for what data you would like to extract.
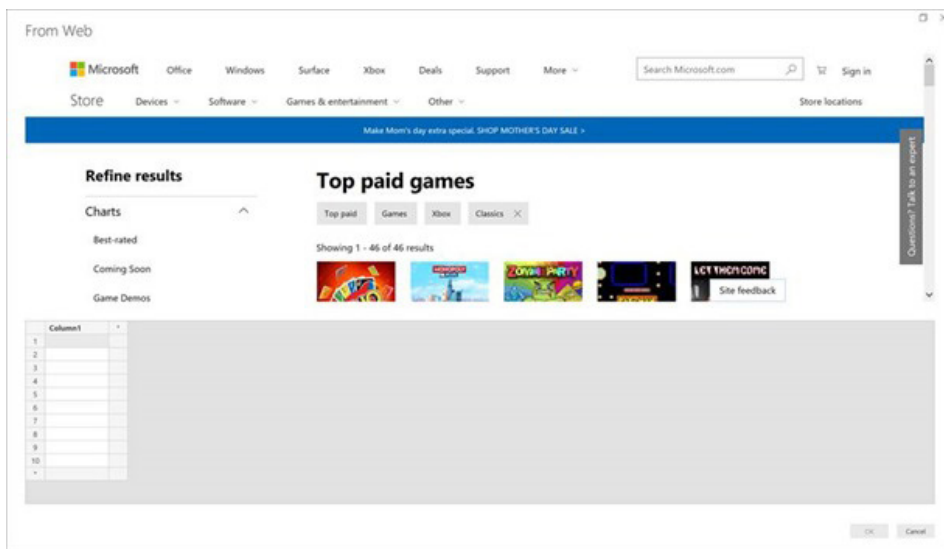
For example, in this webpage we would like to extract the **Name** and **Price** for each game. We can achieve that simply by specifying a couple of examples for each column, like showed in rows 3 and 5 in the following screenshot. After specifying these samples, Power Query is able to detect the rest of values to extract from this webpage based upon smart data extraction algorithms.
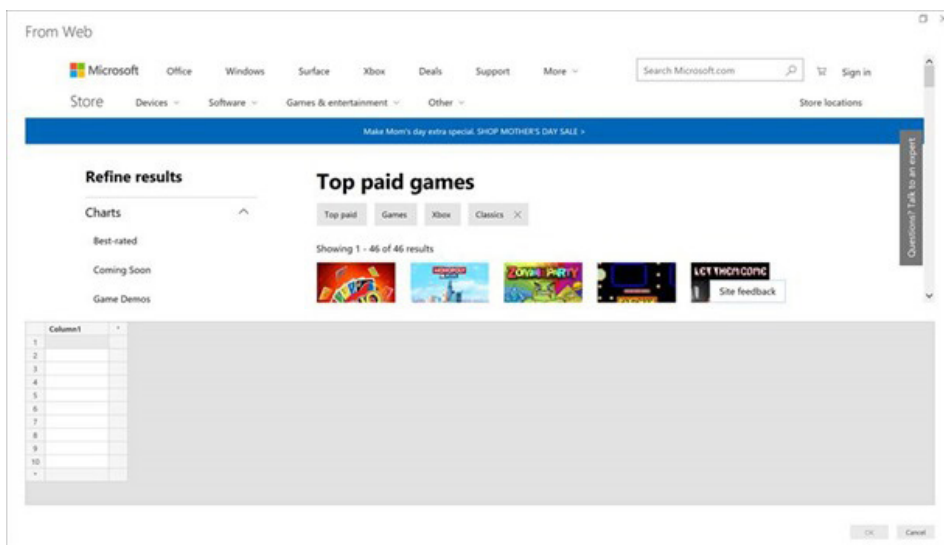
Once you are happy with the data extracted from the webpage, you can click 'OK', which will take you into the Query Editor, where you can apply further data transformations and filters, or combine this table with data coming from other data sources.
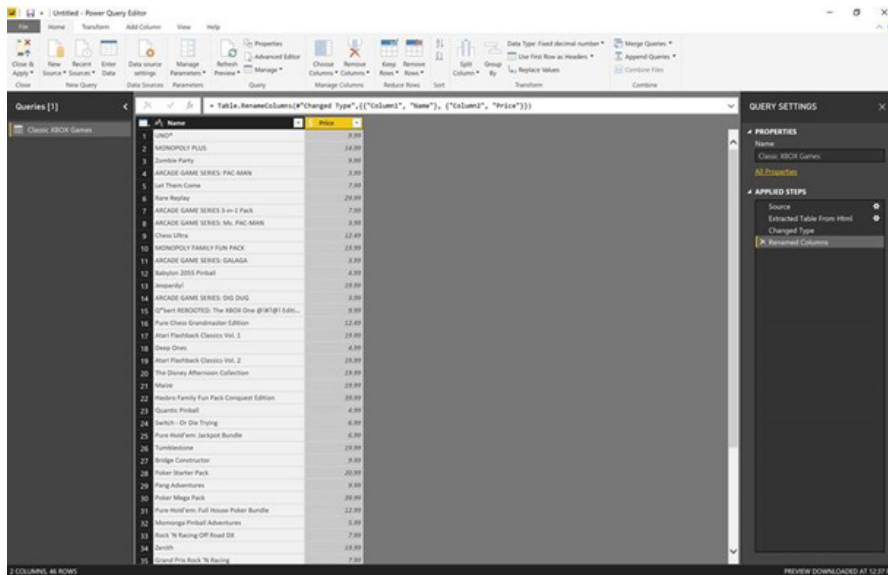
It is understood that over the next few monthly releases Microsoft plans to enhance this new 'Web By Example' experience in a couple of ways:

1. allowing you to add one or more tables in a single pass, either multiple By Example tables, or a combination of auto-detected and By Example tables

2. allowing you to specify examples by clicking at the relevant content in the Web Page preview, within the Add Table By Example dialog, instead of requiring you to type in the examples.

This follows logically from the popular 'Add Column From Examples', which also allows you to apply data transformations based on sample output values on top of any table in the Power Query Editor.

With the new 'Web By Example' feature, Microsoft is providing an initial Preview of how Smart Data Extraction algorithms can be applied on top of semi-structured data sources like HTML webpages. Microsoft has announced that they are lining up several Smart Data Preparation capabilities within Power Query for many different scenarios.

Common Data Service for Apps connector (Beta)

There's a new connector in this update to enable users to import data from Common Data Service for Apps. This allows you to securely store and manage data that is used in applications developed or from Microsoft / other third-party providers. Data within CDS for Apps is stored within a set of standard and custom entities. An entity is a set of fields used to store data similarly to a table within a database.

The Common Data Service for Apps connector is available under the Online Services category in the Get Data dialog.
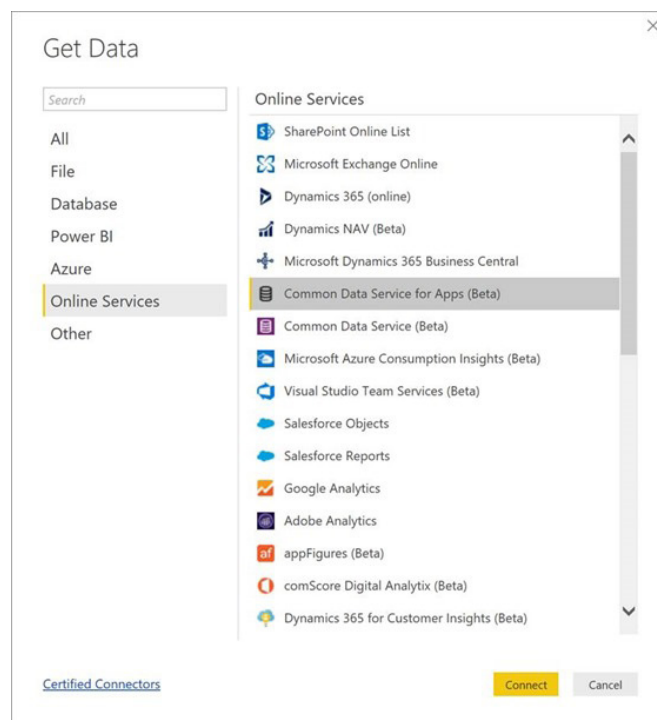
Azure KustoDB connector (Beta)

Azure Kusto is a big-data, interactive analytics platform that provides ultra-fast telemetry search and advanced text search for any type of data. Kusto is often used for the Internet of Things (IoT), troubleshooting and diagnostics, monitoring, security research, usage analytics and more.

This is currently in Preview phase. You can sign up to Azure Kusto here: http://aka.ms/kustopreview.

This Power BI Desktop update adds a new connector allowing you to connect to your Azure KustoDB data in order to analyse it and build reports. This connector may be found under the 'Azure' category within the 'Get Data' dialog:
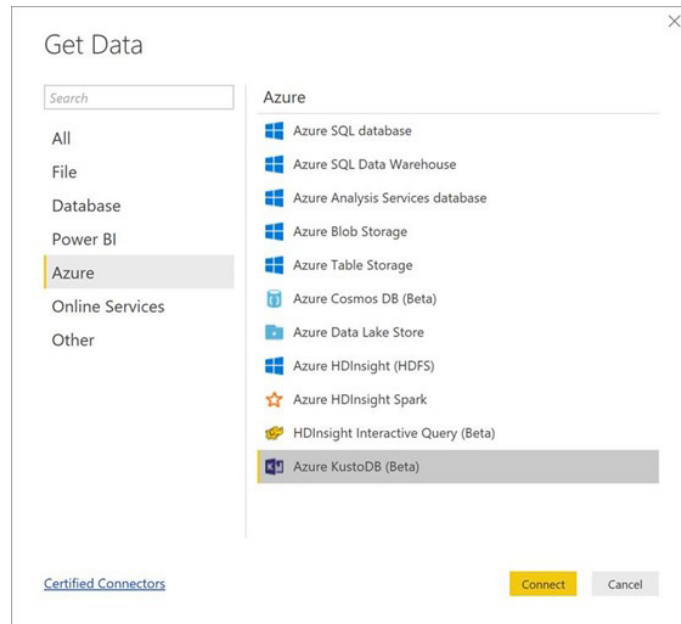
After selecting this connector, you can specify a Kusto Cluster and, optionally, a Database and Table or query to retrieve data, as well as other advanced options. You can then establish a connection using either Import or DirectQuery mode against your Kusto cluster.
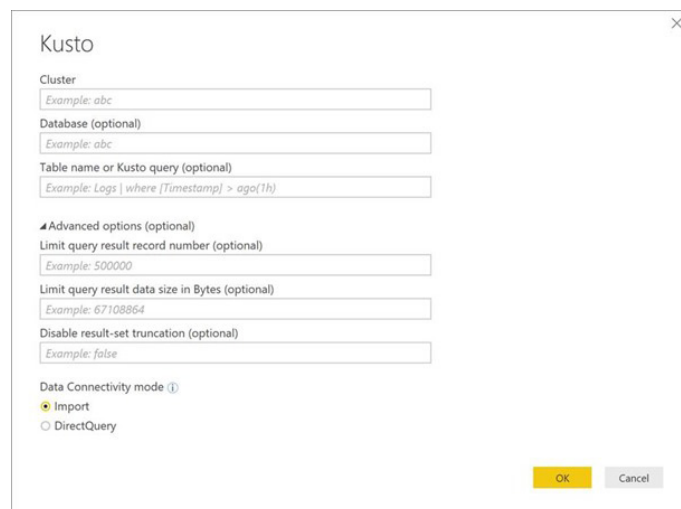
Google BigQuery and Azure HDInsight Spark connectors now Generally Available (GA)

Two of the connectors that have been in Beta for the past few months have now reached General Availability (GA):

- The Google BigQuery connector can be found under the 'Database' category within the 'Get Data' dialog
- The Azure HDInsight Spark connector is located under the 'Azure' category in the 'Get Data' dialog.

Adobe Analytics connector update: support for multiple domain logins (Preview)

Based on customer feedback, Microsoft has announced that they are enhancing the Adobe Analytics connector in order to allow users to pull data from multiple domains. In order to try out this connector enhancement, you will need to enable it from the 'Preview Features' tab within the Options dialog:
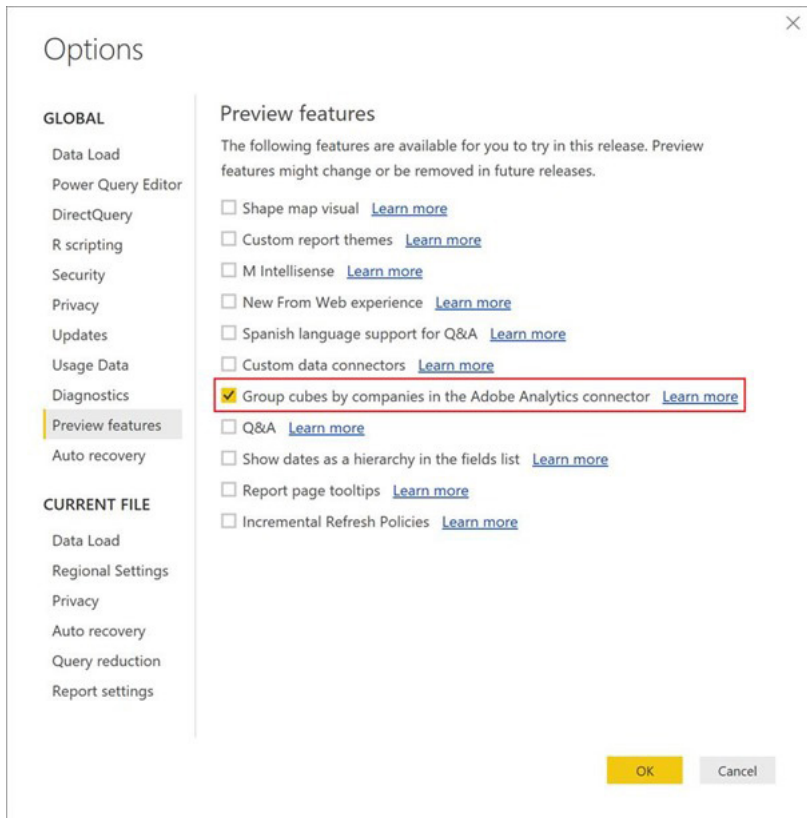
Upon enabling this Preview feature, you will be able to see multiple companies as top-level nodes in the 'Navigator' dialog when using the Adobe Analytics connector.

Visual Studio Team Services connector update: analytics views support

With this latest release, there's now a solution for integrating Power BI with VSTS Analytics. The new Analytics views feature in VSTS makes getting work tracking data into Power BI easier, and it works for large accounts. Similar to a work items query, an 'Analytics View' specifies filters that scope the result of work items data and the columns. Additionally, views allow you to report on past revisions of work items and easily create trend reports.

VSTS provides a set of Default Analytics views that work well for customers with smaller accounts and basic scenarios. Larger accounts can easily scope your data and history to exactly what you want to report on in Power BI. Analytics views you create in the Analytics hub in VSTS are immediately available to select from the VSTS Power BI Data Connector.
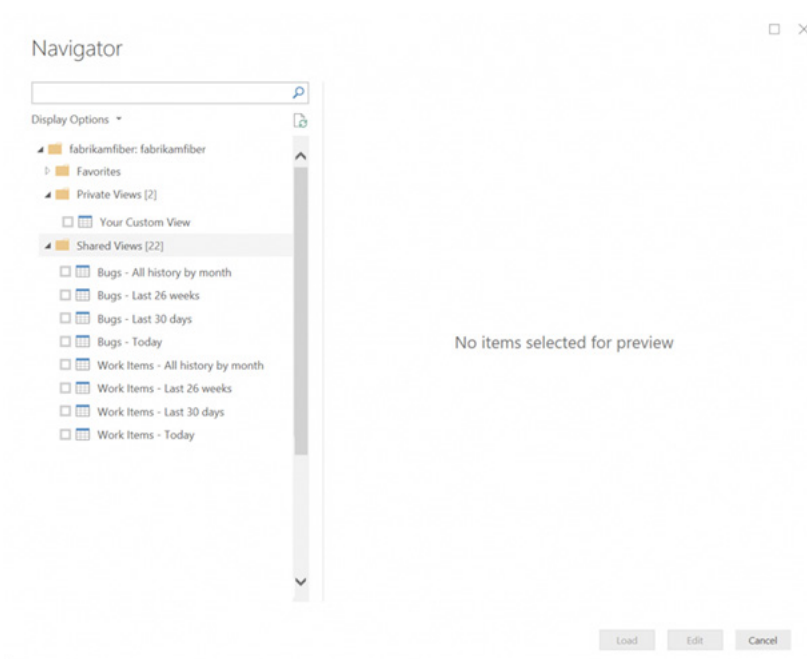
OLE DB connector update: support for alternate Windows credentials

The May release enhances the authentication options for the OLE DB connector too, by adding the ability to provide alternate user credentials when using the Windows authentication type.
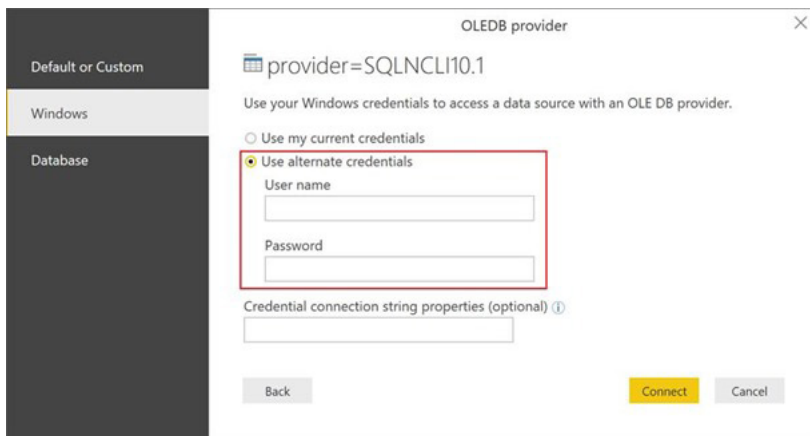
SAP BW DirectQuery connector update: improved technical name support

When connecting to SAP BW, it was previously possible to see the SAP BW technical name of the dimensions, hierarchies and measures in the navigator (as well as the longer friendly name). With this update, it is also possible to see those same technical names within the field list when connected using DirectQuery. These names will appear in the Description property for the relevant field, as well as in the tooltip caption for the field.
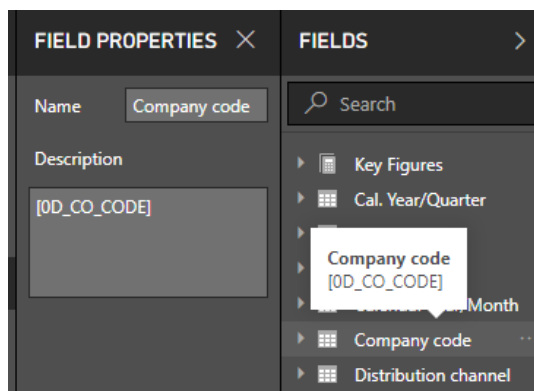
Improvements to Add Column From Examples

One of the best features in Power BI (and Power Query for that matter), Add Column From Examples enables you to easily define new columns that derive data from existing columns based on data transformations, by providing a few examples of the expected output values and allowing Power Query's smart detection logic to automatically infer which transforms should be applied.

This update provides two enhancements to Add Column From Examples:

1. **composition of data transformations:** with this update, it is now possible to derive new columns from examples that require the composition of multiple column transformations. For example, extracting from **Full Name** and **Job Title** columns the Name initials followed by the uppercased version of the job title in parenthesis
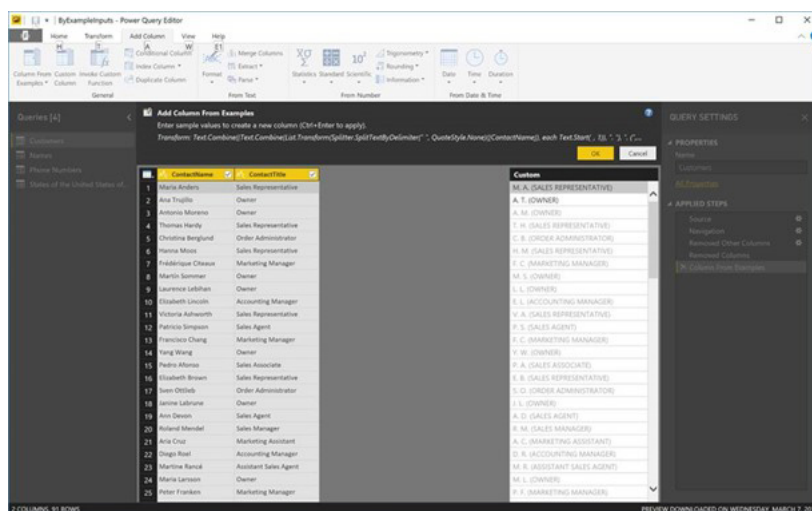
2. **domain specific transformations:** the set of supported data transformations in this feature has now been enhanced by including specialised, domain-specific transformations, in Power Query's smart detection logic, such as additional Date extraction (5/8/2018 -> MAY-2018) and other such similar transformations.

That's it for this month – no doubt there will be much more next month!

Latest Updates for Power BI Service and Mobile

As always, it's not just Power BI Desktop that gets revisions. Microsoft has announced three new / revised features:

- Audit logs on by default
- Update for On-premises data gateway
- Drill down and up on Mobile.

Here's a brief look at each of these.

Audit logs on by default

Only Microsoft would proclaim that "…we're excited to announce … audit logs"! And yet, here they are. This month sees the process simplified for turning on audit logs to track activities for your Power BI service tenant. Previously, it was required that users went to their admin portal in the Service and turn these on (in addition to turning on the functionality in the Office 365 Admin Centre). Now, users may simply enable it in your Office 365 tenant and Power BI activities will show up without any configurations. It should also be noted that customers in sovereign cloud tenants also have auditing available in their environments.

Update for On-premises data gateway

There's a new update for the Power BI On-premises data gateway. The update includes a public preview of the custom data connectors support in personal gateways, single sign-on (SSO) support for SAP Business Warehouse Server (BW) using Kerberos, and an updated mashup engine.

Drill down and up on Mobile

You can now analyse your data and get more insights on the go by using the drill down and drill up feature on Power BI Mobile. Simply tap on a data point on a report visual to bring up the new tooltip, and if the drill options are available, look for the up and down arrows at the bottom of the tooltip box. Tapping on the down arrow will bring you to the next level in the hierarchy related to that data point.

Just as with Power BI Desktop, we expect more updates next month…

Power BI Custom Visuals for Developers and Power Users

Custom Visuals enable modellers and developers to extend the existing chart set in Excel and Power BI using standard Open Source technologies, like JavaScript and D3. This means that if you have built – or found! – a snazzy visualization based on web technologies, and you're wondering how to get it into Excel for those of us that insert charts daily, then look no further. Indeed, if you're a Power BI developer who has already built custom visuals, your visual can now reach a much wider audience. That's because the same technology powers the Custom Visuals feature in both products. You can write your visual once, and have it work in both places.

There are plenty of examples out there already (you might not even realise these are custom visualisations):

Custom Visuals provide several key benefits:

- **Intuitive insertion experience:** Custom Visuals live alongside existing charts in Excel. There are new entry points in the Chart Ribbon, as well as a dedicated tab in the 'Insert Chart' dialog
- **Tailored Office Store experience:** Like Office add-Ins, Custom Visuals can be published to the Microsoft Store. Exploring new charting options in the store is a one-click tailored experience that lets users navigate directly to a set of Custom Visuals
- **Intuitive UI controls:** Excel provides common User Interface (UI) helping users connect visuals to their spreadsheet data, as well as configure properties. Providing this UI gives users consistent experience across all visuals
- **Enterprise ready:** Not all Custom Visuals are meant for the public Microsoft Store. Enterprise developers can continue building visuals in-house for their specific line-of-business needs (such as, for example, an airline company building a custom "airplane visual" for displaying information about seat booking). Office 365 administrators will have the ability to deploy visuals in the same way that Office add-ins are deployed, and those new chart types will appear in the 'Insert Chart' dialog automatically without any additional work needed by users
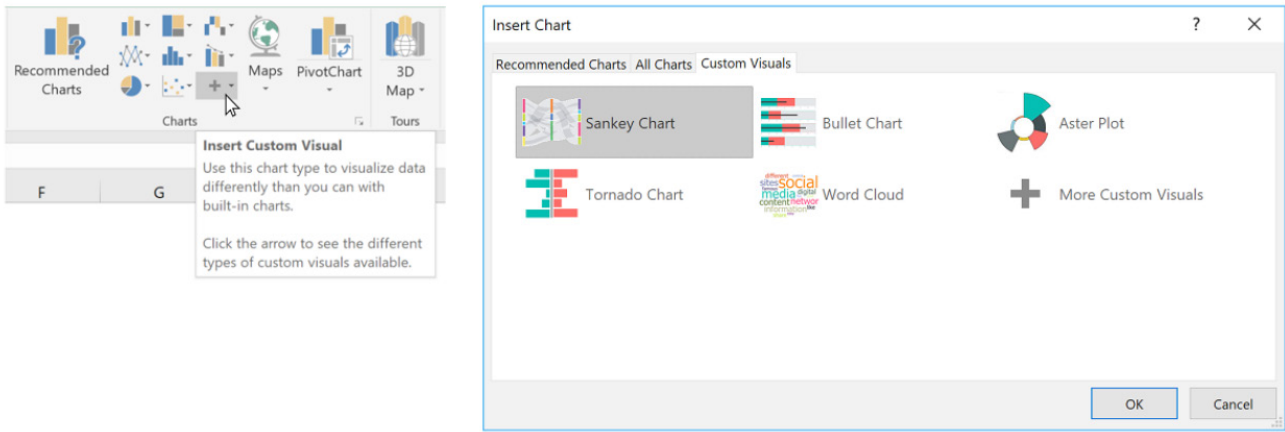
Note, these visuals are just examples of the types of visuals in the Office App Store.
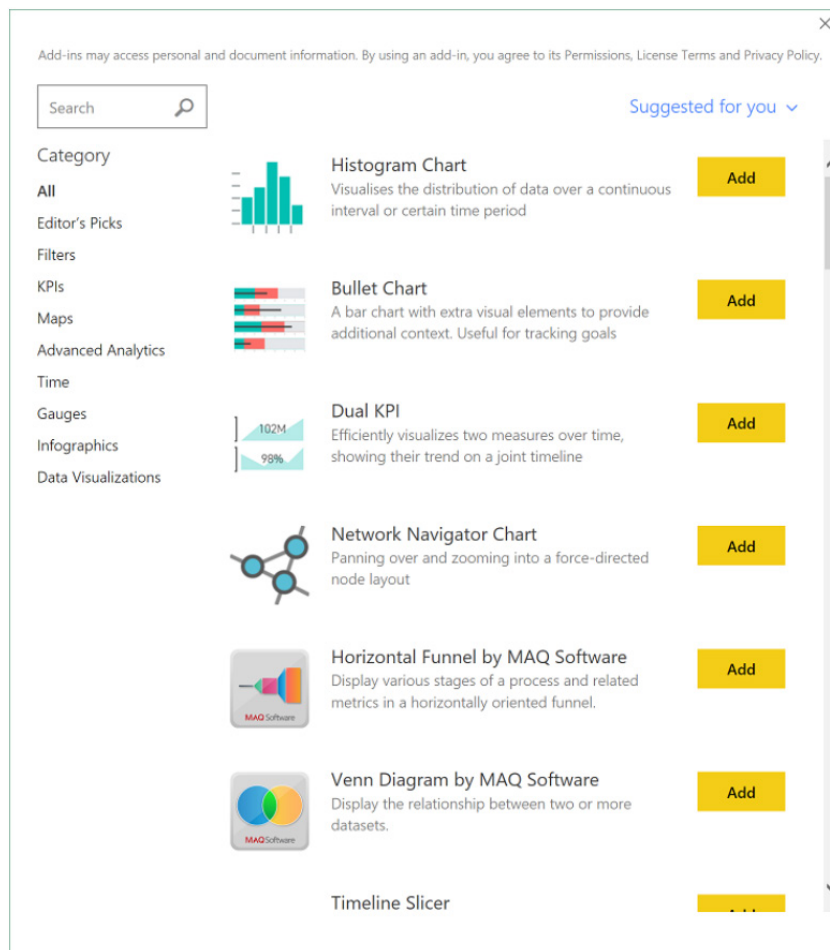
Excel provides a tailored view of the Office App Store that lets you focus on just the Custom Visuals. Note, these example visuals *(shown above)* are existing Custom Visuals for Power BI and may not all be available in Excel.
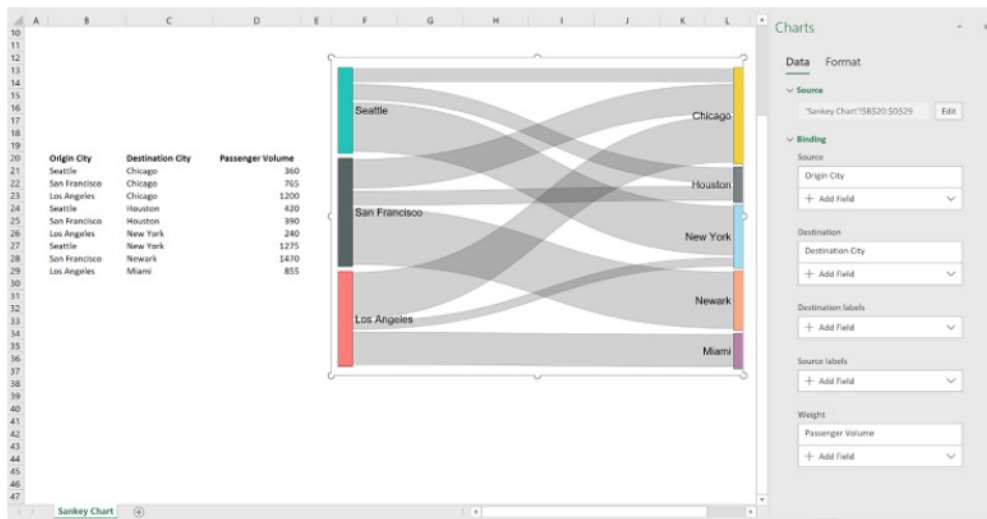
The task pane helps users connect their Custom Visuals to spreadsheet data, as well as configure settings on the visual. The same task pane appears for all visuals, making the user experience easy and familiar for users across all visuals.

The combination of a more tightly integrated experience together with a customised store will give data visualisation developers and modellers seeking new charts an easy to use medium.

The A to Z of Excel Functions: CONVERT

Are you a **CONVERT?** This function converts a number from one measurement system to another. For example, **CONVERT** can translate a table of distances in miles to a table of distances in kilometres.

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

CONVERT(number, from_unit, to_unit)

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

- **number:** this is the value in **from_unit** to convert
- **from_unit:** this represents the units for **number**
- **to_unit:** this is the units for the <u>result</u>. **CONVERT** accepts the following text values (in quotation marks) for **from_unit** and **to_unit**.

We often encounter financial models and spreadsheets falling over due to the significant prevalence of hard code. One common reason is due to analysts converting data from one measure or unit to another (*e.g.* from kilograms to parsecs, or something like that!).

Some modellers will go the extra mile (pun intended) by having a reference section where conversion factors are stored and referenced, *e.g.*

Inches in a kilometre	39,370.08
Light years in a parsec	0.3066014
Grams in a pound	453.59237
Number of tablespoons in a barrel of oil	10,752

The problem with this approach is that figures may be transposed, typed over or stated the wrong way around (*e.g.* a common conversion error we found was tonnes in a ton). These numbers are constant – and there is another way.

If you are not familiar with this function already, let us introduce you to the CONVERT function:

=CONVERT(number,from_unit,to_unit).

Since Excel 2007 and the advent of Formula AutoComplete, this function has really come into its own. For example, to generate / confirm the first conversion factor, simply use 1,000 for the number and locate "meters" *(sic)*
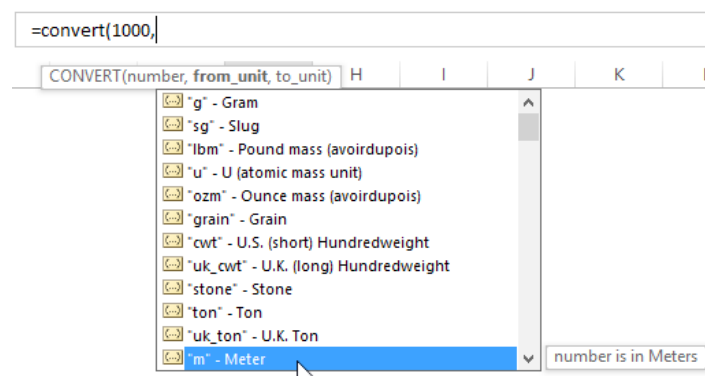
Then, after selecting the appropriate 'from' unit, the list for the third argument will automatically filter for meaningful conversion units (e.g. "kg" will not appear):
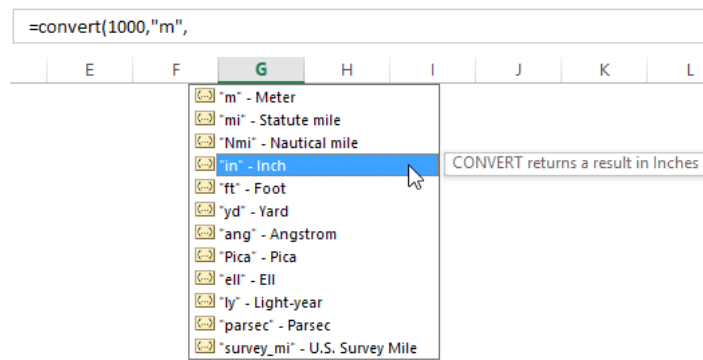
Simple!

The only criticism we have is that the units do not appear to be in any logical order (e.g. alphabetical), but, unlike U2, you can usually find what you're looking for.

Here's the full list of "disciples" (*i.e.* "converts" – get it?):

Weight and mass	From_unit or to_unit
Gram	g
Slug	sg
Pound mass (avoirdupois)	lbm
U (atomic mass unit)	u
Ounce mass (avoirdupois)	ozm
Grain	grain
U.S. (short) hundredweight	cwt or "shweight"
Imperial hundredweight	uk_cwt or "lcwt" ("hweight")
Stone	stone
Ton	ton
Imperial ton	uk_ton or "LTON" ("brton")
Distance	From_unit or to_unit
Meter	m
Statute mile	mi
Nautical mile	Nmi
Inch	in
Foot	ft
Yard	yd
Angstrom	ang
Ell	ell
Light-year	ly
Parsec	parsec or "pc"
Pica (1/72 inch)	Picapt or "Pica"
Pica (1/6 inch)	pica
U.S survey mile (statute mile)	survey_mi

Time	From_unit or to_unit
Year	yr
Day	day or "d"
Hour	hr
Minute	mn or "min"
Second	sec or "s"

Pressure	From_unit or to_unit
Pascal	Pa (or "p")
Atmosphere	atm (or "at")
mm of Mercury	mmHg
PSI	psi
Torr	Torr

Force	From_unit or to_unit
Newton	N
Dyne	dyn (or "dy")
Pound force	lbf
Pond	pond

Energy	From_unit or to_unit
Joule	J
Erg	e
Thermodynamic calorie	c
IT calorie	cal
Electron volt	eV (or "ev")
Horsepower-hour	HPh (or "hh")
Watt-hour	Wh (or "wh")
Foot-pound	flb
BTU	BTU (or "btu")

Power	From_unit or to_unit
Horsepower	HP (or "h")
Pferdestärke	PS
Watt	W (or "w")

Magnetism	From_unit or to_unit
Tesla	T
Gauss	ga

Temperature	From_unit or to_unit
Degree Celsius	C (or "cel")
Degree Fahrenheit	F (or "fah")
Kelvin	K (or "kel")
Degrees Rankine	Rank
Degrees Réaumur	Reau

Volume (or l iquid measure)	From_unit or to_unit
Teaspoon	tsp
Modern teaspoon	tspm
Tablespoon	tbs
Fluid ounce	oz
Cup	cup
U.S. pint	pt (or "us_pt")
U.K. pint	uk_pt
Quart	qt
Imperial quart (U.K.)	uk_qt
Gallon	gal
Imperial gallon (U.K.)	uk_gal
Liter	l or "L" ("lt")
Cubic angstrom	ang3 or "ang^3"
U.S. oil barrel	barrel
U.S. bushel	bushel
Cubic feet	ft3 or "ft^3"
Cubic inch	in3 or "in^3"
Cubic light-year	ly3 or "ly^3"
Cubic meter	m3 or "m^3"
Cubic Mile	mi3 or "mi^3"
Cubic yard	yd3 or "yd^3"
Cubic nautical mile	Nmi3 or "Nmi^3"
Cubic Pica	Picapt3, "Picapt^3", "Pica3" or "Pica^3"
Gross Registered Ton	GRT ("regton")
Measurement ton (freight ton)	MTON

Area	From_unit or to_unit
International acre	uk_acre
U.S. survey/statute acre	us_acre
Square angstrom	ang2 or "ang^2"
Are	ar
Square feet	ft2 or "ft^2"
Hectare	ha
Square inches	in2 or "in^2"
Square light-year	ly2 or "ly^2"
Square meters	m2 or "m^2"
Morgen	Morgen
Square miles	mi2 or "mi^2"
Square nautical miles	Nmi2 or "Nmi^2"
Square Pica	Picapt2, "Pica2", "Pica^2" or "Picapt^2"
Square yards	yd2 or "yd^2"

Information	From_unit or to_unit
Bit	bit
Byte	byte

Speed	From_unit or to_unit
Admiralty knot	admkn
Knot	kn
Meters per hour	m/h or "m/hr"
Meters per second	m/s or "m/sec"
Miles per hour	mph

Prefix	Multiplier	Abbreviation
yotta	1E+24	Y
zetta	1E+21	Z
exa	1E+18	E
peta	1E+15	P
tera	1E+12	T
giga	1000000000	G
mega	1000000	M
kilo	1000	k
hecto	100	h
dekao	10	da or "e"
deci	0.1	d
centi	0.01	c
milli	0.001	m
micro	0.000001	u
nano	0.000000001	n
pico	1E-12	p
femto	1E-15	f
atto	1E-18	a
zepto	1E-21	z
yocto	1E-24	y

Binary Prefix	Prefix Value	Abbreviation	Derived from
yobi	2^80 = 1 208 925 819 614 629 174 706 176	Yi	yotta
zebi	2^70 = 1 180 591 620 717 411 303 424	Zi	zetta
exbi	2^60 = 1 152 921 504 606 846 976	Ei	exa
pebi	2^50 = 1 125 899 906 842 624	Pi	peta
tebi	2^40 = 1 099 511 627 776	Ti	tera
gibi	2^30 = 1 073 741 824	Gi	giga
mebi	2^20 = 1 048 576	Mi	mega
kibi	2^10 = 1024	ki	kilo

It should be further noted that:

- if the input data types are incorrect, **CONVERT** returns the *#VALUE!* error value
- if the unit does not exist, **CONVERT** returns the *#N/A* error value
- if the unit does not support a binary prefix, **CONVERT** returns the **#N/A** error value
- if the units are in different groups, **CONVERT** returns the *#N/A* error value
- unit names and prefixes are case-sensitive.

Here's an example:

	A	B	C	D
1	**Formula**	**Description**	**Result**	
2	=CONVERT(1,"lbm","kg")	Converts 1 pound mass to kilograms.	0.453592370	
3	=CONVERT(68,"F","C")	Converts 68 degrees Farenheit to Celsius.	20	
4	=CONVERT(2.5,"ft","sec")	Data types are not the same, so an error is returned.	#N/A	
5	=CONVERT(CONVERT(100,"ft","m"),"ft","m")	Converts 100 square feet into square metres.	9.290304000	
6				

The A to Z of Excel Functions: CORREL

Do we need to corral you regarding **CORREL?** If you say no, we might get into a fight concerning the OK corral… Anyway… *The correlation coefficient*, sometimes also called the *cross-correlation coefficient*, is a quantity that gives the quality of a least squares fitting to the original data. Clear as mud? OK, let me try it in English instead.

The correlation coefficient is a measure that determines the degree to which two variables' movements are associated. The range of values for the correlation coefficient is between -1 and +1. A correlation of -1 indicates what is called perfect negative correlation, whilst a correlation of +1 indicates a perfect positive correlation.

To be clear, a value of exactly +1 means there is a perfect positive relationship between the two variables. For a positive increase in one variable, there is also a proportional positive increase in the second variable. A value of exactly -1 means there is a perfect negative relationship between the two variables. This shows the variables move in opposite directions: for a positive increase in one variable, there is a proportional decrease in the second variable. If the correlation is zero, this simply means there is no relationship between the two variables. The strength of the relationship varies in degree based on the value of the correlation coefficient. For example, a value of 0.25 indicates there is a positive relationship between the two variables, but it is weak.

It should be noted that this statistic only measures the linear relationship between the variables. Nonlinear relationships between two variables cannot be captured or expressed by this coefficient.

The **CORREL** function returns the correlation coefficient of the **array1** and **array2** cell ranges. This can be used to determine the relationship between two properties (*i.e.* the correlation coefficient). For example, you can examine the relationship between a location's average temperature and the use of air conditioners.

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

CORREL(array1, array2)

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

- **array1**: this is required. This represents a cell range of values.
- **array2**: this is also required and denotes a second cell range of values.

It should be further noted that:

- If an array or reference argument contains text, logical values or empty cells, those values are ignored; however, cells with the value zero <u>are</u> included
- If **array1** and **array2** have a different number of data points, **CORREL** returns the *#N/A* error value
- If either **array1** or **array2** is empty, or if **s** (the standard deviation) of their values equals zero, CORREL returns the *#DIV/0!* error value

The equation for the correlation coefficient is:

$$Correl(X,Y) = \frac{\sum (x-\bar{x})(y-\bar{y})}{\sqrt{\sum (x-\bar{x})^2 \sum (y-\bar{y})^2}}$$

where

$\bar{x}$ and $\bar{y}$

are the sample means, *i.e.* **AVERAGE(array1)** and **AVERAGE(array2)**.

Please see our example below:

	A	B	C
1	Data 1	Data 2	
2	6	18	
3	8	23	
4	2	6	
5	5	15	
6	7	20	
7	1	3	
8			
9			
10	Formula	Description	Result
11	=CORREL(A2:A7,B2:B7)	Correlation coefficient of the two datasets in columns A and B.	0.99905728
12			

Upcoming SumProduct Training Courses

Location	Course	Date	Duration
Darwin	Financial Modelling	4 - 5 Jun 2018	2 days
Sydney	Power Pivot, Power Query and Power BI	18 - 20 Jun 2018	3 days
Sydney	Financial Modelling	25 - 26 Jun 2018	2 days
Melbourne	Excel Tips & Tricks	2 Jul 2018	1 day
Melbourne	Financial Modelling	3 - 4 Jul 2018	2 days
Melbourne	Power Pivot, Power Query and Power BI	17 - 19 Jul 2018	3 days
Sydney	Excel Tips & Tricks	13 Aug 2018	1 day
Sydney	Financial Modelling	15 - 16 Aug 2018	2 days
Brisbane	Excel Tips & Tricks	27 Aug 2018	1 day
Brisbane	Financial Modelling	28 - 29 Aug 2018	2 days
Sydney	Power Pivot, Power Query and Power BI	10 - 12 Sep 2018	3 days
Perth	Financial Modelling	17 - 18 Sep 2018	2 days
Perth	Power Pivot, Power Query and Power BI	19 - 21 Sep 2018	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, it's time to take **CONTROL** of numbers:

Keystroke	What it does
CTRL + 0	Hide column
CTRL + 1	Format cells
CTRL + 2	Bold (toggle)
CTRL + 3	Italics (toggle)
CTRL + 4	Underline (toggle)
CTRL + 5	Strikethrough (toggle)
CTRL + 6	Toggle Show, Hide and Show Placeholders for Objects
CTRL + 7	Excel 2003: Toggle Standard toolbar visibility
CTRL + 8	Toggle showing outline symbols
CTRL + 9	Hide row

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.

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· **Model reviews / audits for internal and external purposes**
· **M&A work**
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Link to Others

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