



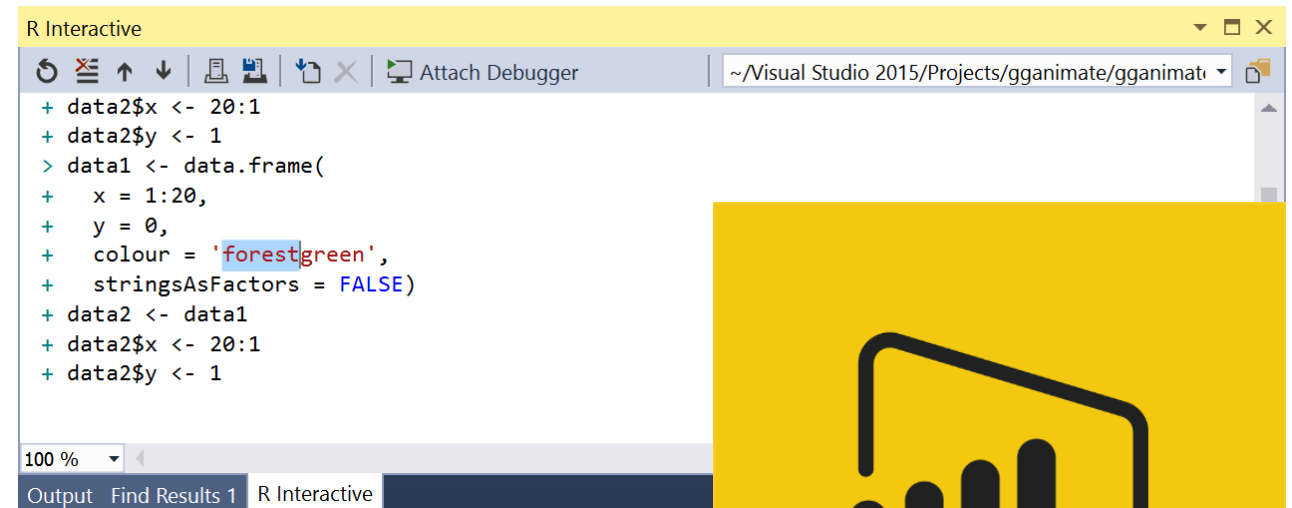
Business Analytics with Power BI

Microsoft Services



Module 3: Predictive Analytics with Power BI and R

Lesson 4: Using R with Power BI



```
+ data2$x <- 20:1
+ data2$y <- 1
> data1 <- data.frame(
+   x = 1:20,
+   y = 0,
+   colour = 'forestgreen',
+   stringsAsFactors = FALSE)
+ data2 <- data1
+ data2$x <- 20:1
+ data2$y <- 1
```

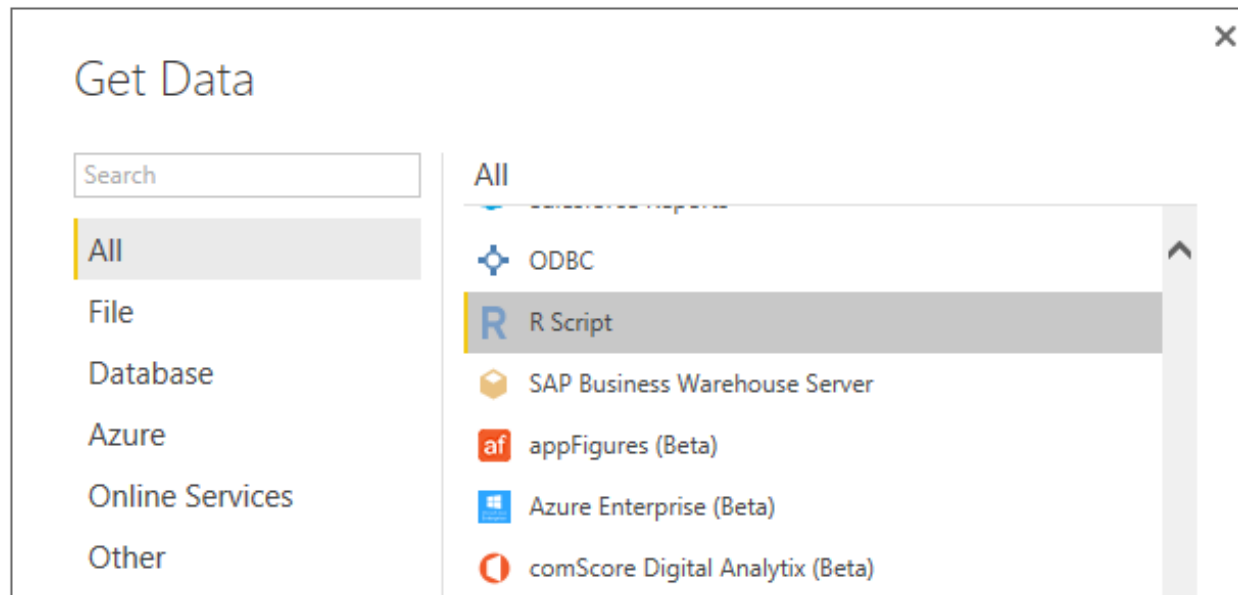


R as a Data Source

- Power BI Desktop does not include, deploy or install the R engine
- To run R scripts in Power BI Desktop, you must separately install R on your local computer

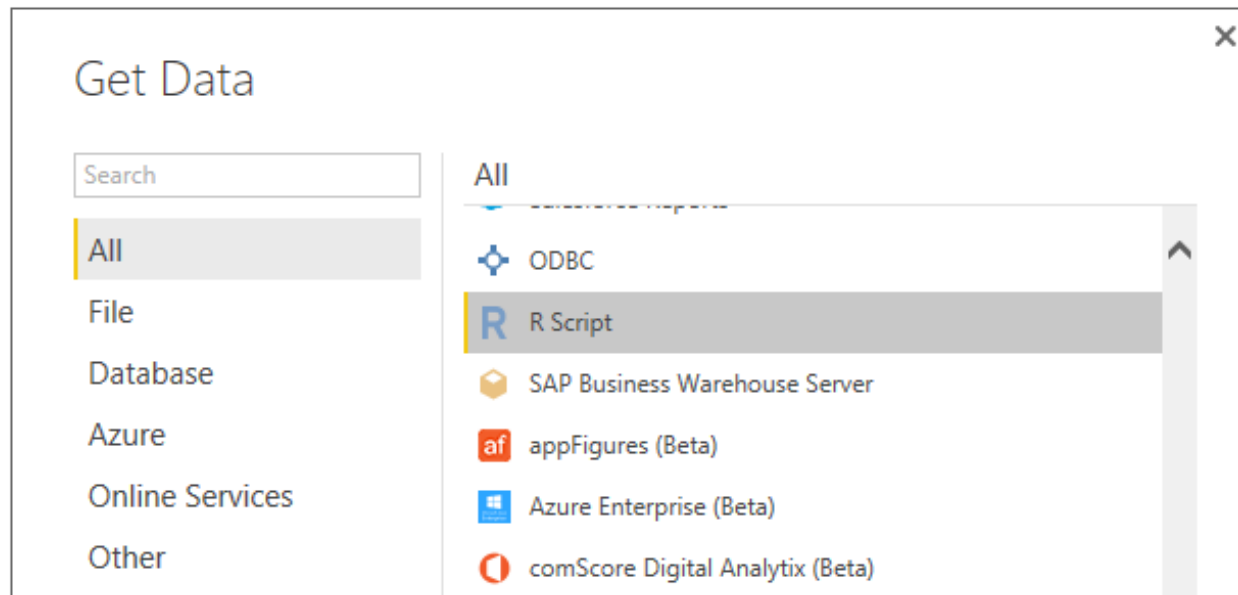
<https://msdn.microsoft.com/en-us/microsoft-r/>

<https://cran.r-project.org/>

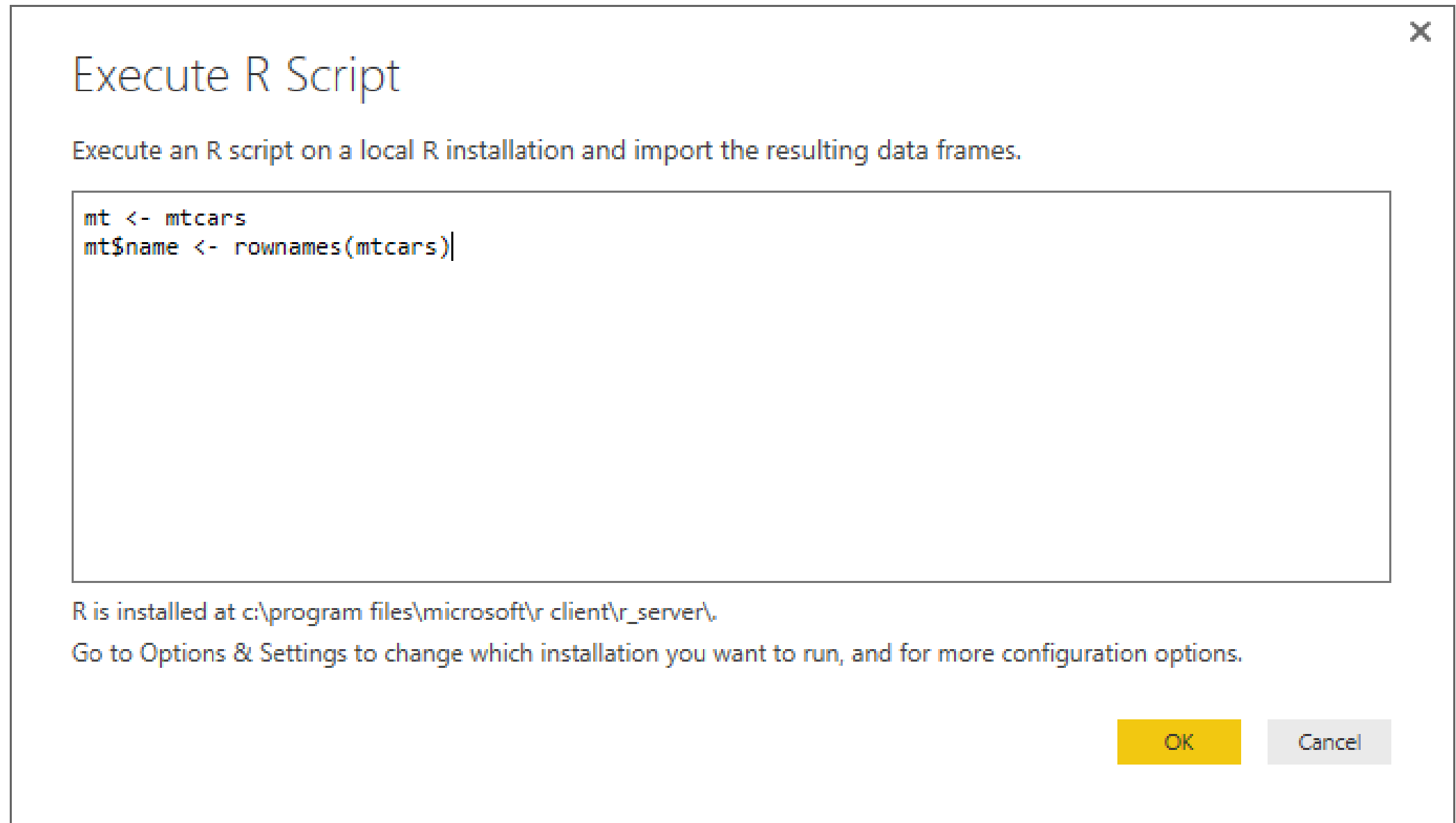


R as a Data Source

- Power BI has R as a data source. It receives a R script as a “query”
- The R script must return a data frame
- This data frame will be seen by Power BI as a dataset (like any other)
- The R engine that process the script must be installed on the same machine that has Power BI Desktop



R as a Data Source



R as a Data Source

Navigator

Display Options ▾

▾ R [1]

✓ mt

mt

	qsec	vs	am	gear	carb	name
52	16.46	0	1	4	4	Mazda RX4
75	17.02	0	1	4	4	Mazda RX4 Wag
32	18.61	1	1	4	1	Datsun 710
15	19.44	1	0	3	1	Hornet 4 Drive
44	17.02	0	0	3	2	Hornet Sportabout
46	20.22	1	0	3	1	Valiant
57	15.84	0	0	3	4	Duster 360
19	20	1	0	4	2	Merc 240D
15	22.9	1	0	4	2	Merc 230
44	18.3	1	0	4	4	Merc 280
44	18.9	1	0	4	4	Merc 280C
27	17.4	0	0	3	3	Merc 450SE
73	17.6	0	0	3	3	Merc 450SL
78	18	0	0	3	3	Merc 450SLC
25	17.98	0	0	3	4	Cadillac Fleetwood
24	17.82	0	0	3	4	Lincoln Continental
45	17.42	0	0	3	4	Chrysler Imperial
12	19.47	1	1	4	1	Fiat 128
15	18.52	1	1	4	2	Honda Civic
35	19.9	1	1	4	1	Toyota Corolla
55	20.01	1	0	3	1	Toyota Corona
52	16.87	0	0	3	2	Dodge Challenger
35	17.3	0	0	3	2	AMC Javelin

Load Edit Cancel

Fields

Search

▾ mt

- Σ am
- Σ carb
- Σ cyl
- Σ disp
- Σ drat
- Σ gear
- Σ hp
- Σ mpg
- name
- Σ qsec
- Σ vs
- Σ wt

R as a Data Source

The screenshot displays the Microsoft Power BI Desktop interface. The main window is titled "Untitled - Query Editor" and shows a list of queries on the left sidebar, with "mt" selected. The "Advanced Editor" window is open, showing the R code for the "mt" query. The code uses the `R.Execute` function to execute an R script that reads data from the `mtcars` dataset and returns it as a table. The code is as follows:

```
let
    Source = R.Execute("mt <- mtcars#(1f)mt$name <- rownames(mtcars)"),
    mt1 = Source{[Name="mt"]}[Value]
in
    mt1
```

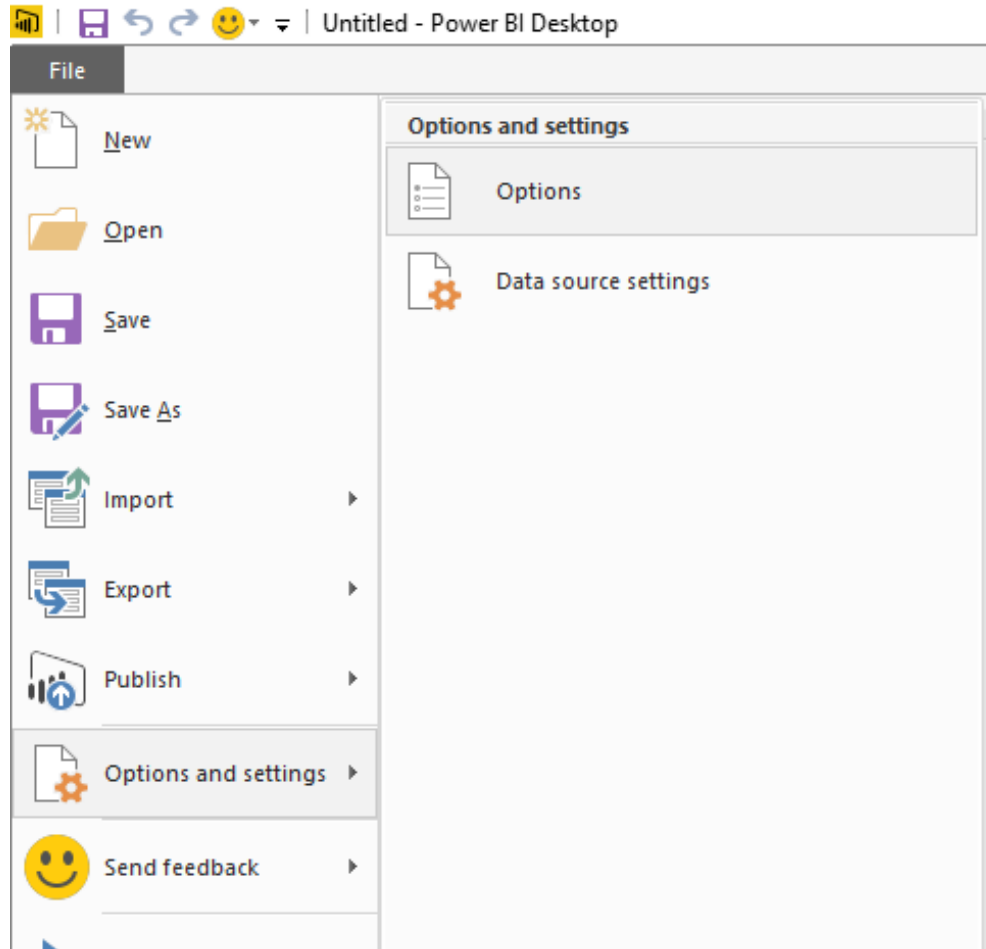
Below the code editor, a green checkmark indicates "No syntax errors have been detected." The "Done" button is highlighted in yellow. The background shows the Power BI Desktop interface with a table of data (12 columns, 32 rows) and a "Settings" pane on the right.

12 COLUMNS, 32 ROWS

Microsoft Confidential

PREVIEW DOWNLOADED AT 4:05 AM

Changing R Location / Installation



Options

GLOBAL

- Data Load
- Query Editor
- DirectQuery
- R Scripting**
- Security
- Privacy
- Updates
- Usage Data
- Diagnostics
- Preview Features

CURRENT FILE

- Data Load
- Regional Settings
- Privacy

R Script Options

Select which R home directory Power BI Desktop should use. Either select a home directory from the detected R installations in the drop-down, or specify a different R home directory by browsing to its location.

Detected R home directories:

- C:\Program Files\Microsoft\R Client\R_SERVER\
- C:\Program Files\R\R-3.2.2
- C:\Program Files\Microsoft\R Client\R_SERVER**
- C:\Program Files\Microsoft\MRO\R-3.2.4
- C:\Program Files\RRO\RRO-3.2.2-for-RRE-7.5.0\R-3.2.2
- C:\Program Files\RRO\R-3.1.3
- Other

OK

Cancel

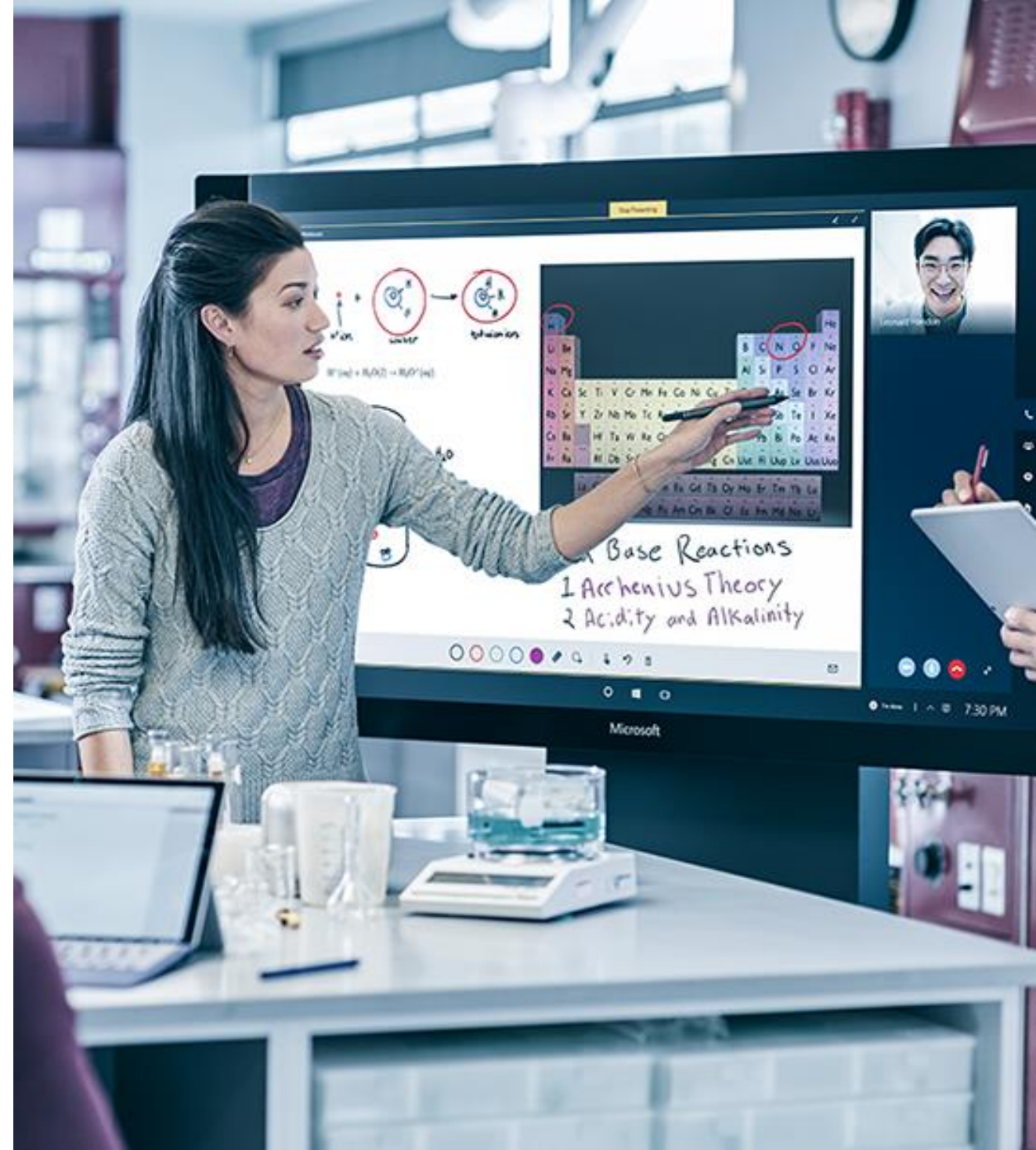
Demonstration: R as a Data Source

R as a Data Source



Lab: Using R with Power BI

Exercise 01 – Using R as a Data Source



R Visuals

We can use a script in R to generate a chart in a Power BI report

This chart will be connected (by default) with other graphical elements

You can also see it in browser (Power BI Service) and mobile apps

After the report is published, the R visual is processed by a R service inside the Power BI Service

You must verify if the libraries being used are available in the service

Libraries that need internet connection **will not** work

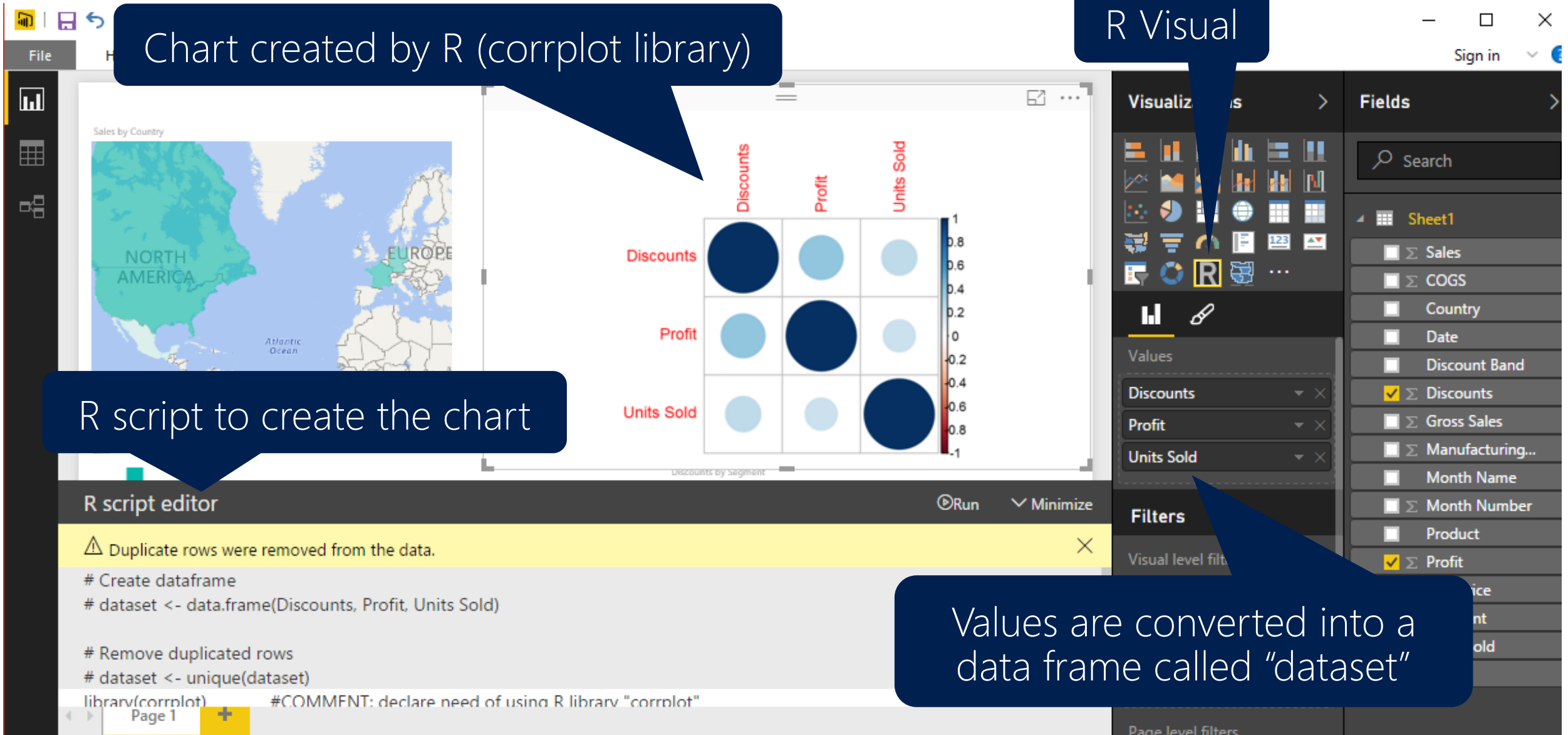
R Visuals

Chart created by R (corrplot library)

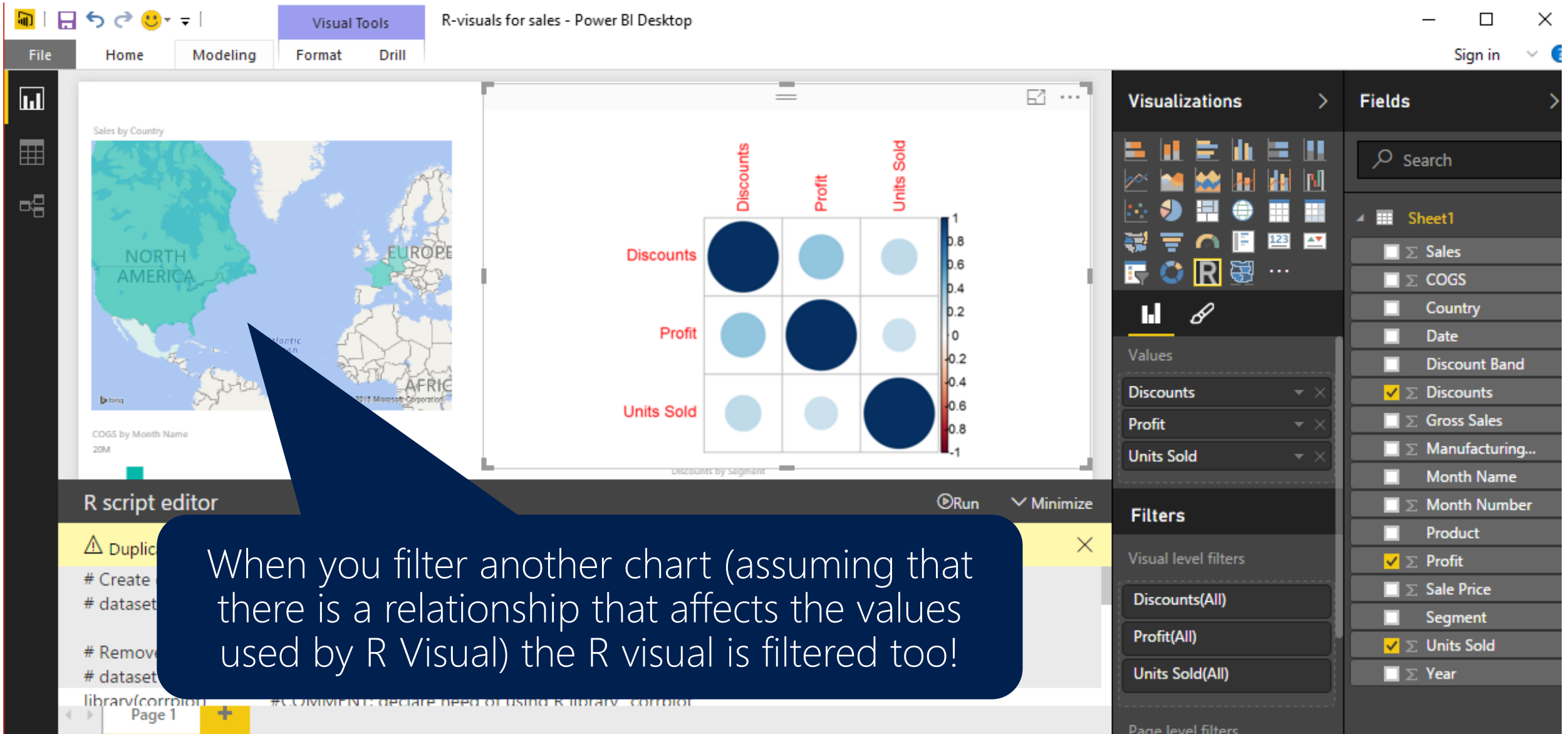
R Visual

R script to create the chart

Values are converted into a data frame called "dataset"



R Visuals



R Visuals

The screenshot displays the Power BI Desktop interface with the R script editor open. The script editor shows a sequence of R commands for data processing and visualization. A callout box points to the `corrplot(M)` line, indicating where the chart is created.

R script editor

```
# Create dataframe
# dataset <- data.frame(Discounts, Profit, Units Sold)

# Remove duplicated rows
# dataset <- unique(dataset)

library(corrplot) #COMMENT: declare need of using R library "corrplot"

M <- cor(dataset) #COMMENT: compute correlation matrix

#COMMENT: Show corrplot, try out different plotting parameters by uncommenting your preferred plotting instruction

corrplot(M)
#corrplot(M, method = "circle", type = "upper", tl.cex=0.7, tl.srt = 45, tl.col = "black")
#corrplot(M, method = "color", tl.cex=0.6, tl.srt = 45, tl.col = "black")
#corrplot(M, method = "pie")
#corrplot.mixed(M)
#corrplot.mixed(M, lower = "ellipse", upper = "circle")
#corrplot(M, order = "hclust", addrect=2)
```

Visualizations

Fields

Filters

Visual level filters

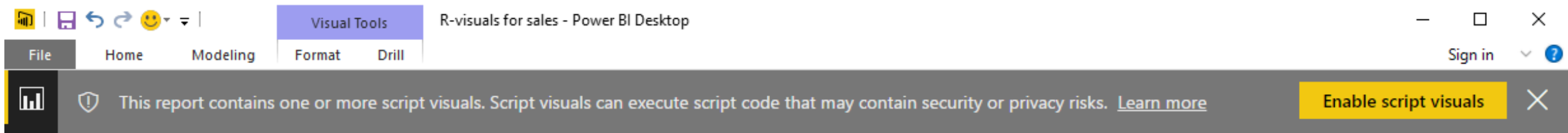
- Discounts(All)
- Profit(All)
- Units Sold(All)

Page level filters

R Visuals

When you open a Power BI Desktop file that contains at least one R Visual, you are prompted to confirm the execution of script visuals

Since scripts can have malicious code, you must confirm the execution



Enable script visuals

Only enable script visuals if you trust the author and source, or after you review and understand their scripts.

Enable

Review

Cancel

R Visuals

Limitations

- Data size limitations – data used by the R visual for plotting is limited to 150,000 rows. If more than 150,000 rows are selected, only the top 150,000 rows are used and a message is displayed on the image
- Calculation time limitation – if an R visual calculation exceeds 5 minutes the execution times out, resulting in an error
- Relationships – as with other Power BI Desktop visuals, if data fields from different tables with no defined relationship between them are selected, an error occurs
- R visuals are refreshed upon data updates, filtering, and highlighting. However, the image itself is not interactive and cannot be the source of cross-filtering

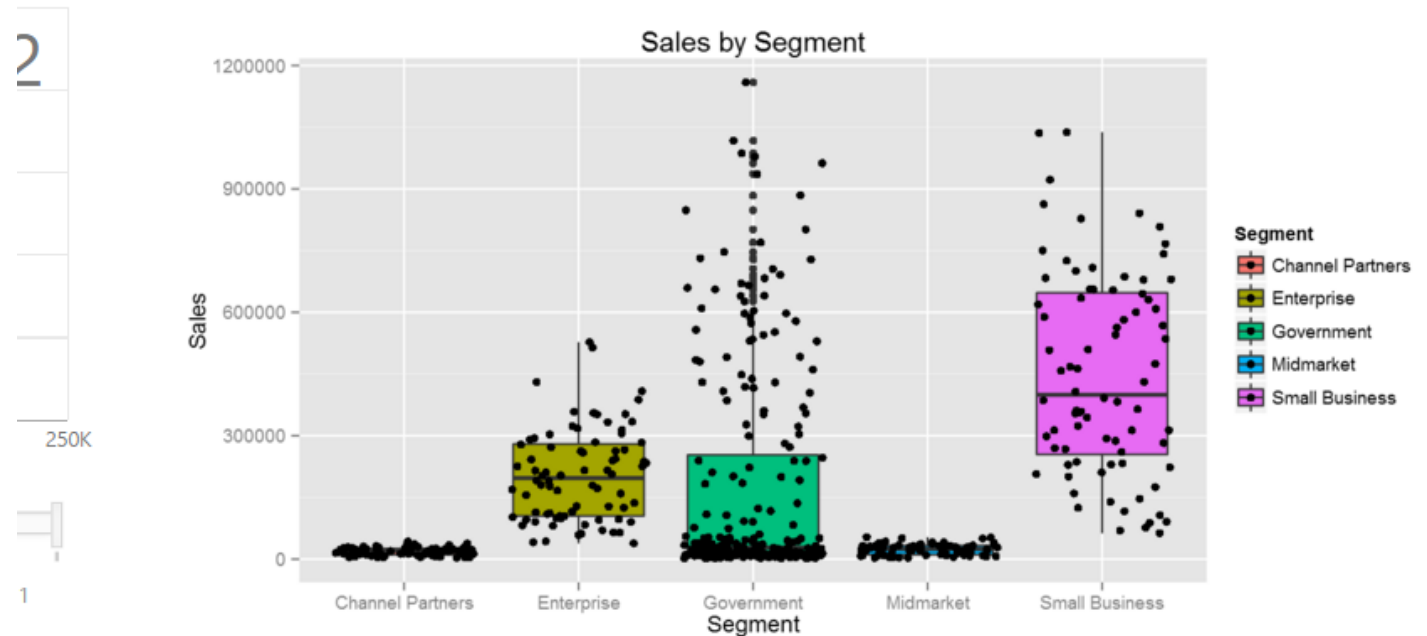
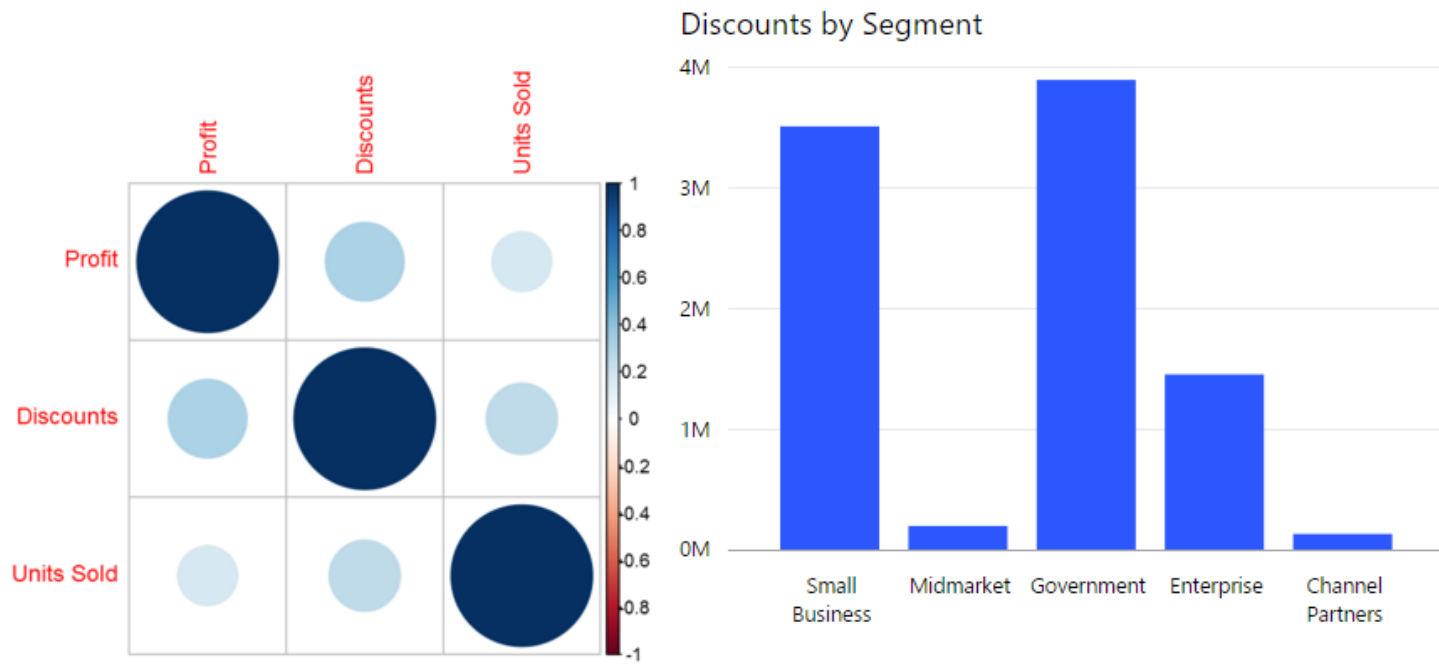
R Visuals

Limitations (cont..)

- R visuals respond to highlighting other visuals, but you cannot click on elements in the R visual in order to cross filter other elements
- Only plots that are plotted to the R default display device are displayed correctly on the canvas. Avoid explicitly using a different R display device

Demonstration: R Visuals

R Visuals



Refreshing R Data

For now, the only supported method to refresh R data (manually or automatically) is using Personal Gateway

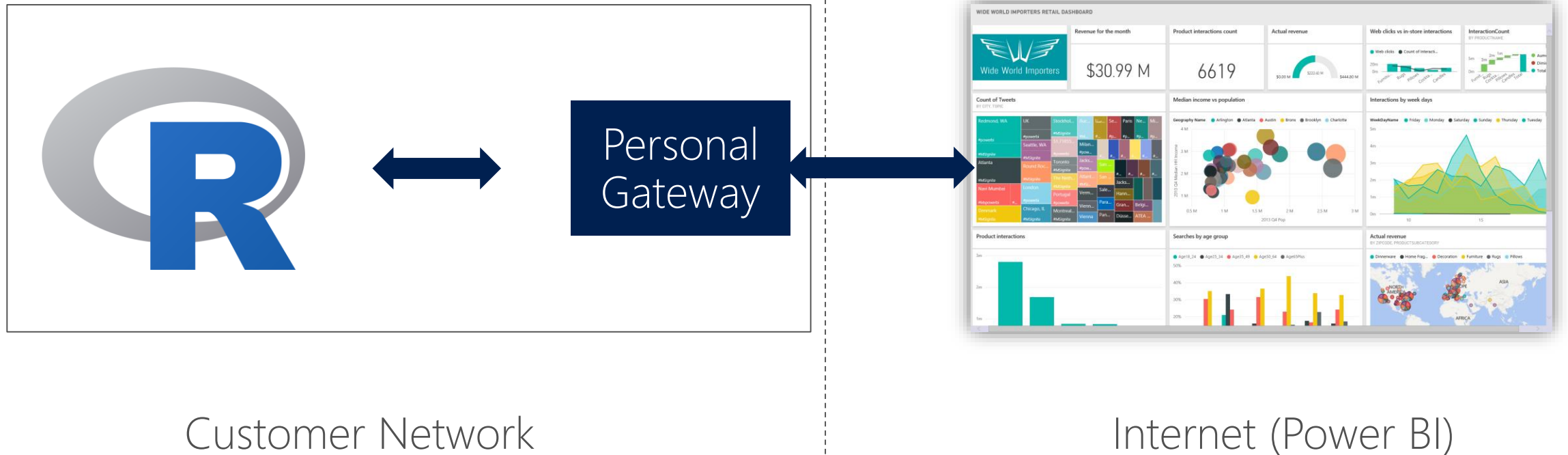
If you don't have admin permissions, the machine must be on and user **logged in**

	With Administrator permissions	Without Administrator permissions
Power BI Gateway - Personal runs as a	Service	Application
Scheduled Refresh	As long as your computer and the gateway service is running, you do not have to be logged in at the scheduled refresh time.	You must be logged in to your computer at the scheduled refresh time.

Refreshing R Data

For now, the only supported method to refresh R data (manually or automatically) is through Power BI Personal Gateway.

Notice that this is required *only when using R as a data source*. R Visuals are rendered entirely on server.



Lab: Using R with Power BI

Exercise 02 – Using R Visuals

