Slides & data: brosz.ca/slides/tableau

Jan 8, 2026

Data Visualization with **Tableau**

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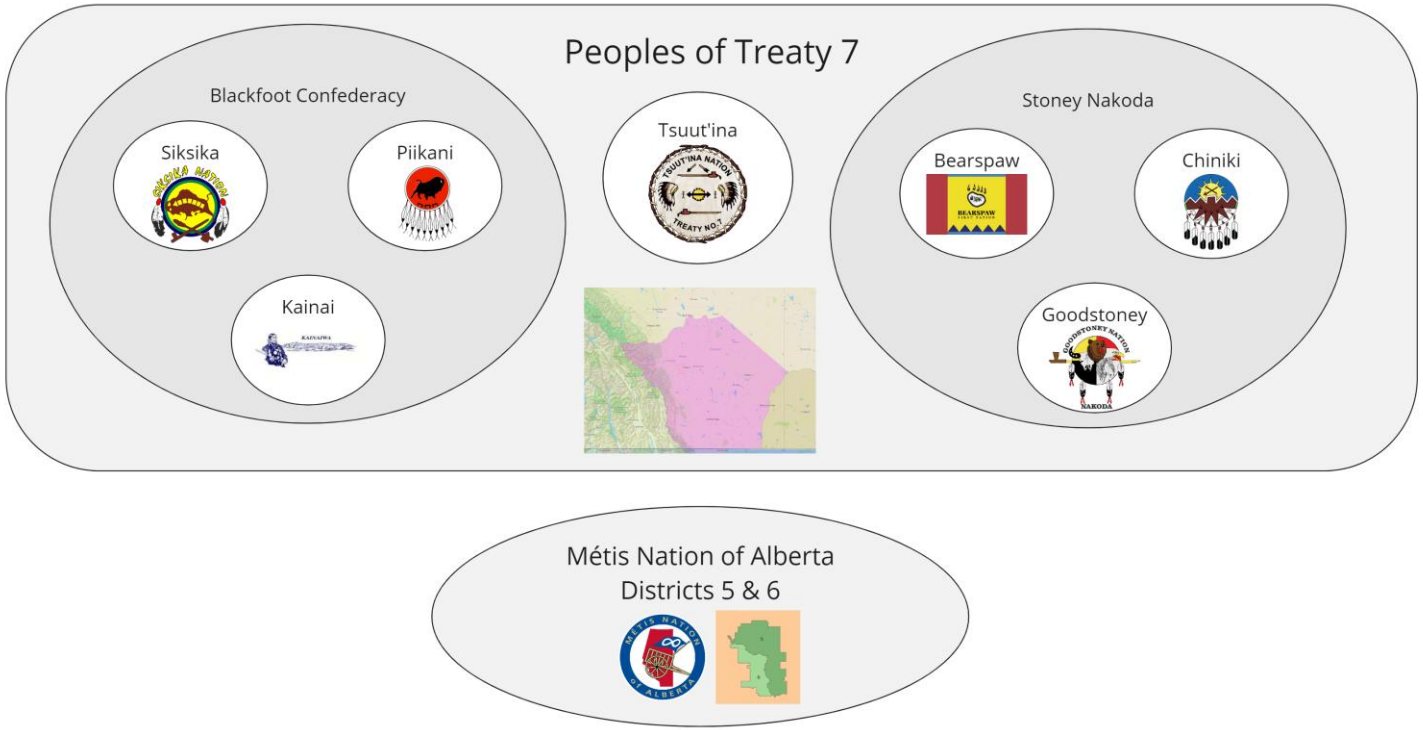


The University of Calgary, located in the heart of Southern Alberta, both acknowledges and pays tribute to the traditional territories of the peoples of Treaty 7, which includes the Blackfoot Confederacy (comprised of the Siksika, the Piikani, and the Kainai First Nations), the Tsuut'ina First Nation, and the Stoney Nakoda (including the Chiniki, Bearspaw, and Goodstoney First nations). The City of Calgary is also home to the Métis Nation of Alberta (Districts Nose Hill 5 and Elbow 6).

Goals

1. What is Tableau?
2. Importing Data
3. How to change chart types and operate Tableau
4. Interactive visualization
5. Exporting your visualization

Slides & data: brosz.ca/slides/tableau

1. What is Tableau?

Developed out of Stanford student's PhD project

Designed for exploration of large multi-dimensional datasets

Pick the data you are interested in, **then** explore to find the best chart type

When Excel just isn't enough . . .

Alternatives: PowerBI, QlikView

Slides & data: brosz.ca/slides/tableau

Tableau Versions

Desktop (Mac & Windows)

- Runs on Windows/Mac
- Can publish results to Tableau's website

Online

- Cloud version

Public (free)

- Free, all data hosted publically (everything online)
- 10 GB of space for data

Prep

- Data wrangling

Reader

- Free, View & interact with Tableau worksheets

Server

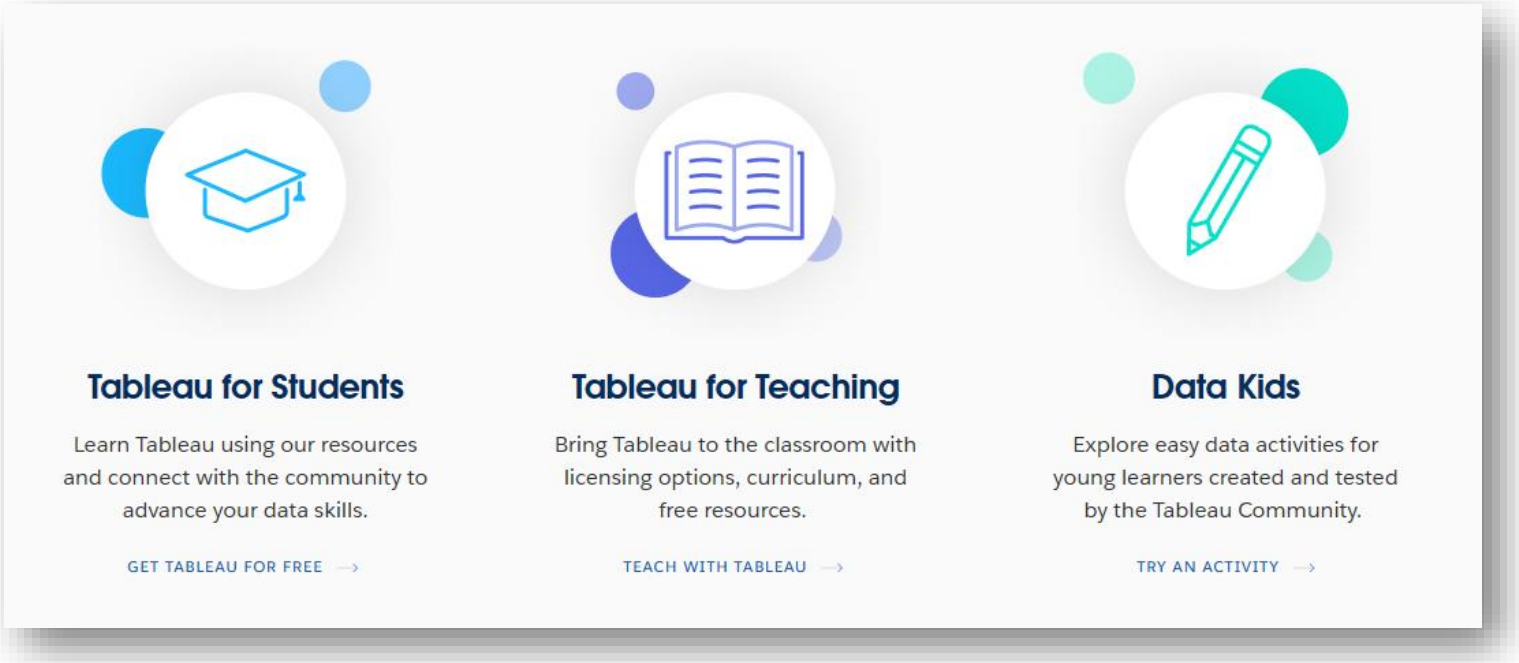
- Can publish results to web & restrict access

Slides & data: brosz.ca/slides/tableau

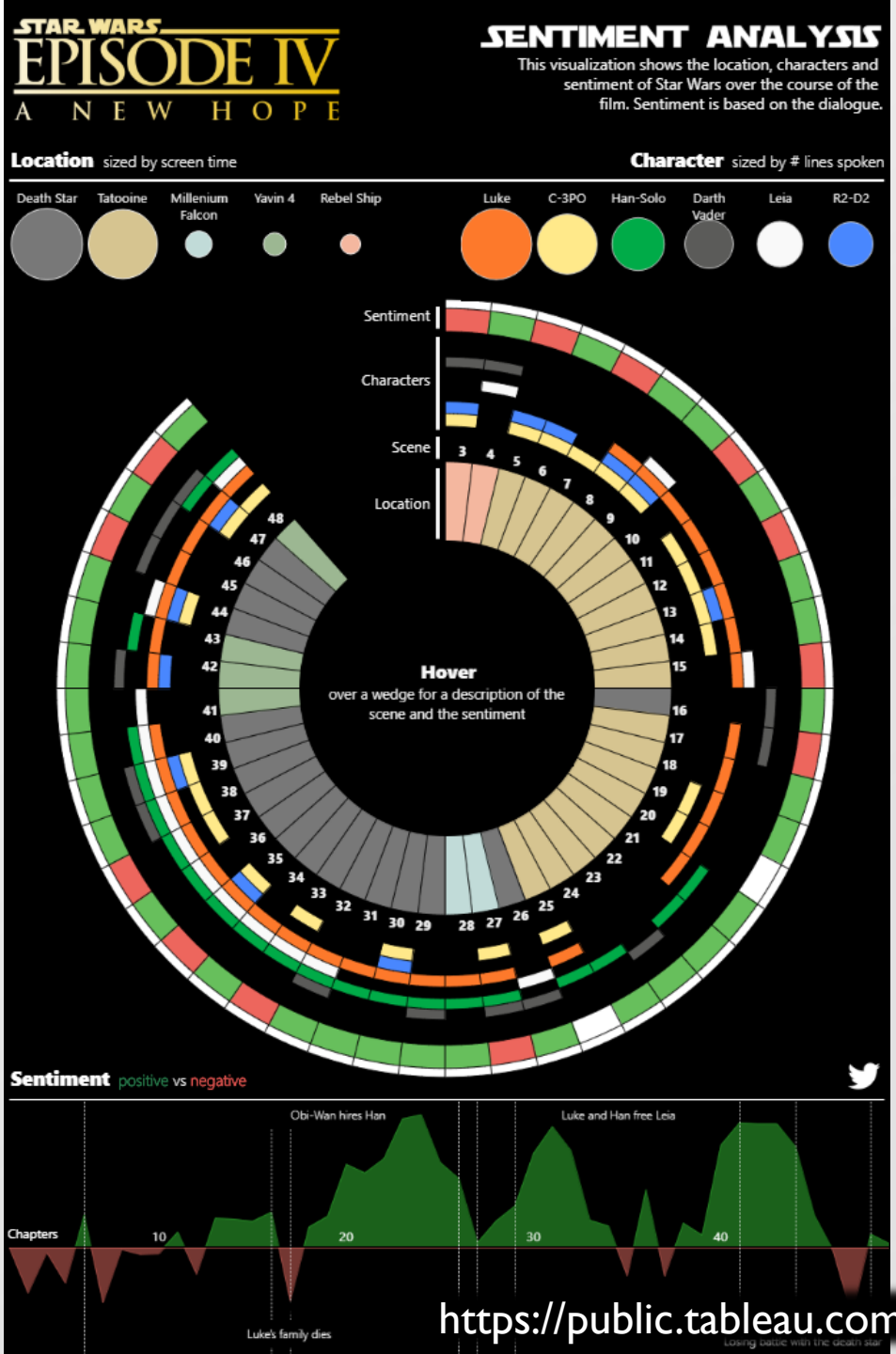
Academic/Student Program

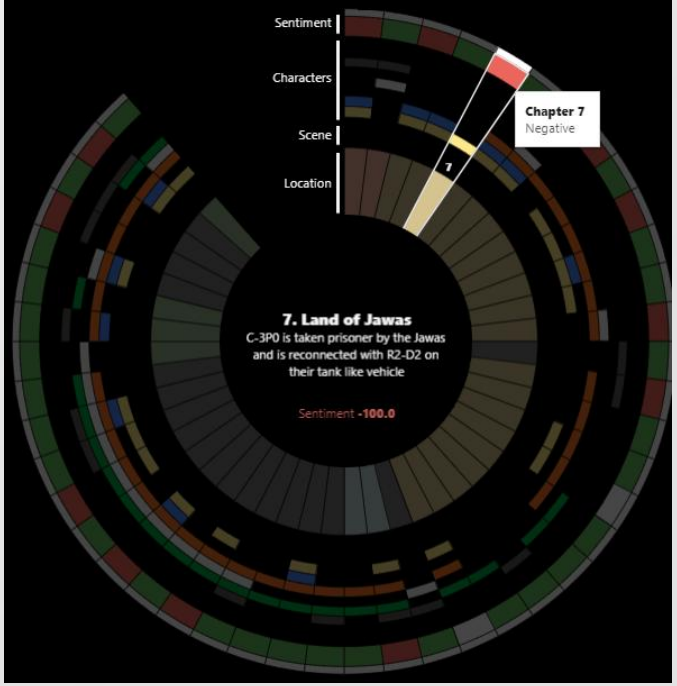
Available for **free** to post-secondary students.

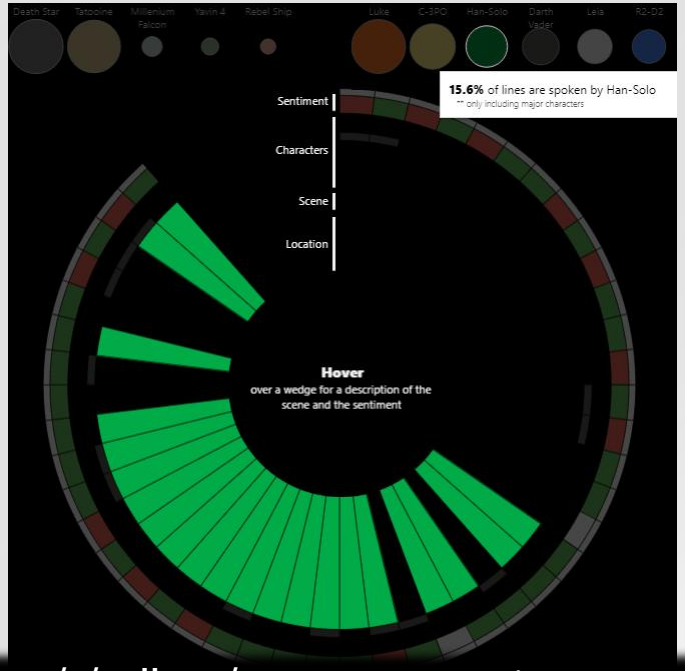
http://www.tableau.com/academic/



https://https://public.tableau.com/en-us/s/gallery/new-york-city-graffiti







https://public.tableau.com/en-us/s/gallery/star-wars-sentiment-analysis

On the demand side, the **Ecological Footprint** measures the ecological assets that a given population requires to produce the natural resources it consumes (including plant-based food and fiber products, livestock and fish products, timber and other forest products, space for urban infrastructure) and to absorb its waste, especially carbon emissions.

On the supply side, a city, state or nation's **biocapacity** represents the productivity of its ecological assets (including cropland, grazing land, forest land, fishing grounds, and built-up land). These areas, especially if left unharvested, can also absorb much of the waste we generate, especially our carbon emissions.

If a population's Ec
region's biocapacity
deficit. Its demand f
land and seas can pr
fish, wood, cotton fo
absorption—exceed
renew. A region in e
importing, liquidatir
overfishing), and/or
atmosphere. If a reg
Ecological Footprin

Da

Select a Year (1961-2014)

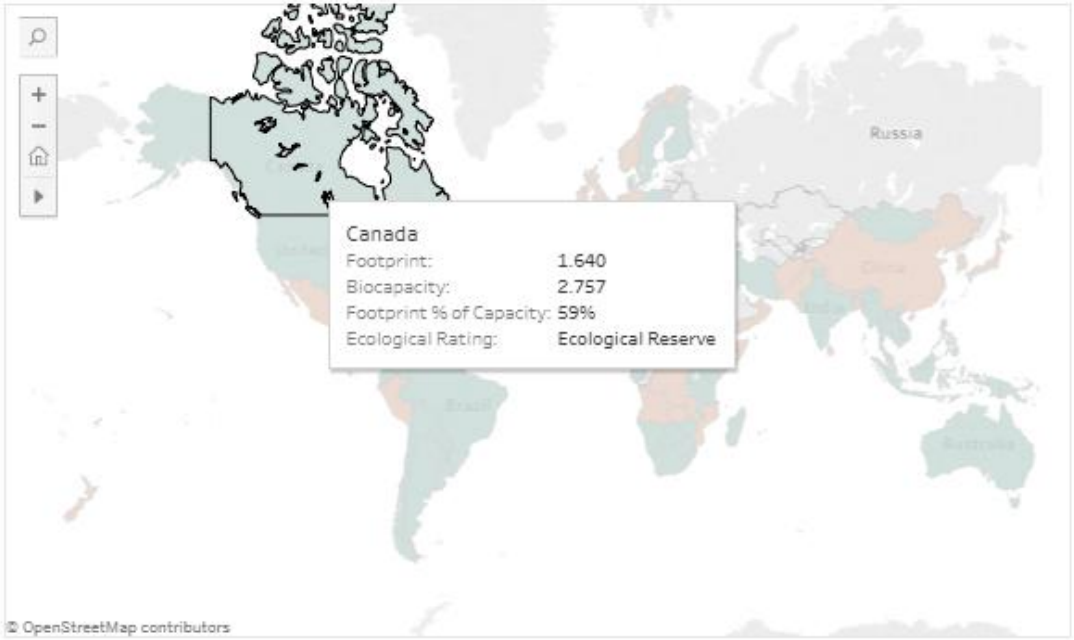
1990

Select an Ecological Asset to Measure

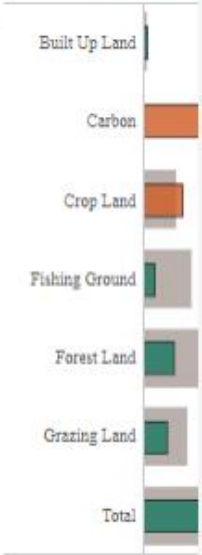
- Built Up Land
- Carbon
- Crop Land
- Fishing Ground
- Forest Land
- Grazing Land
- Total

Ecological **Reserve** or **Deficit** by Country

*click on a country to filter by by Asset View



Ecological **Reserve**

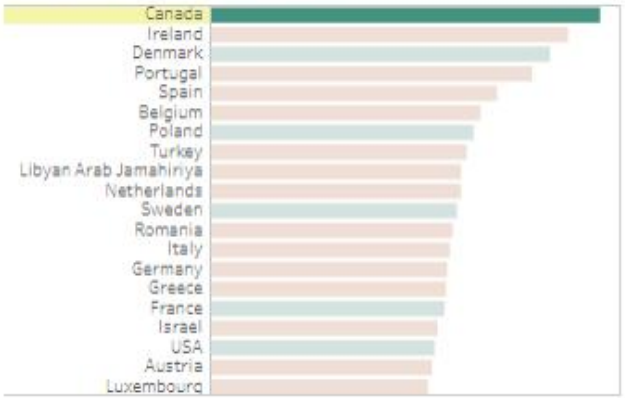


You can also filter for spec
using the drop down.

(All)

20 Countries with the highest Crop Land Ecological Footprint.

*click on a country to filter the By Asset View



https://public.tableau.com/en-us/s/gallery/ecological-footprint

2. Tableau & Data

- File *(excel, csv)*
- Database *(Access, Oracle, MySQL)*
- Online Sources *(Google Analytics, Amazon Redshift)*

Get data files at **brosz.ca/slides/tableau**

  - **calgweather.csv**
    (right click & “save link as…”)

Data

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB
1	Date/Time	Year	Month	Day	Data Qual	Max Temp	Max Temp	Min Temp	Min Temp	Mean Ten	Mean Ten	Heat Deg	Heat Deg	Cool Deg	Cool Deg	Total Rain	Total Rain	Total Snov	Total Snov	Total Prec	Total Prec	Snow on G	Snow on G	Dir of Max	Dir of Max	Spd of Ma	Spd of Max	Gust Flag
2	1/1/2014	2014	1	1	‡	-0.6		-9.7		-5.2		23.2		0		0		1		0.8		9			M	<31		
3	1/2/2014	2014	1	2	‡	8.5		-10		-0.8		18.8		0		0		0		0		11			M	52		
4	1/3/2014	2014	1	3	‡	3		-11		-4		22		0		0		7.8		5.8		8			M	54		
5	1/4/2014	2014	1	4	‡	-11		-21.9		-16.5		34.5		0		0		1		0.2		14			M	44		
6	1/5/2014	2014	1	5	‡	-14.4		-25.5		-20		38		0		0	T	0		0	T	14			M	52		
7	1/6/2014	2014	1	6	‡	3.4		-14.8		-5.7		23.7		0		0		0		0		10			M	33		
8	1/7/2014	2014	1	7	‡	-3		-9.9		-6.5		24.5		0		0		0	T	0	T	8			M	32		
9	1/8/2014	2014	1	8	‡	5.8		-11.4		-2.8		20.8		0		0		0	T	0	T	8			M	50		
10	1/9/2014	2014	1	9	‡	4.6		-6.8		-1.1		19.1		0		0		0		0		7			M	59		
11	1/10/2014	2014	1	10	‡	2.2		-7.7		-2.8		20.8		0		0		0		0					M	44		
12	1/11/2014	2014	1	11	‡	7.8		-9.9		-1.1		19.1		0		0		0	T	0	T	4			M	83		
13	1/12/2014	2014	1	12	‡	2.5		-8.3		-2.9		20.9		0		0		2.9		1.2		4			M	59		
14	1/13/2014	2014	1	13	‡	6		-5.9		0.1		17.9		0		0		2.8		2.6		8			M	87		
15	1/14/2014	2014	1	14	‡	8.6		-8.3		0.2		17.8		0		0		0		0		8			M	76		
16	1/15/2014	2014	1	15	‡	9		-0.3		4.4		13.6		0		0		0		0		3			M	67		
17	1/16/2014	2014	1	16	‡	9.1		-3.3		2.9		15.1		0		0		0		0		2			M	32		
18	1/17/2014	2014	1	17	‡	9.8		-0.5		4.7		13.3		0		0		0		0		2			M	48		
19	1/18/2014	2014	1	18	‡	12.8		-4.2		4.3		13.7		0		0		0		0		0			M	50		
20	1/19/2014	2014	1	19	‡	6.6		-2		2.3		15.7		0		0		0		0		0			M	39		
21	1/20/2014	2014	1	20	‡	4.2		-7.6		-1.7		19.7		0		0		0		0		0			M	43		
22	1/21/2014	2014	1	21	‡	2.6		-5.4		-1.4		19.4		0		0	T	0		0	T	0			M	<31		
23	1/22/2014	2014	1	22	‡	-0.9		-8.2		-4.6		22.6		0		0		1.2		1.2		1			M	<31		
24	1/23/2014	2014	1	23	‡	8.9		-5.5		1.7		16.3		0		0	T	0		0	T	1			M	<31		
25	1/24/2014	2014	1	24	‡	12.4		0.9		6.7		11.3		0		0		0		0		0			M	32		
26	1/25/2014	2014	1	25	‡	11.2		0.5		5.9		12.1		0		0		0		0		0			M	56		
27	1/26/2014	2014	1	26	‡	3.5		-12.4		-4.5		22.5		0		0		0	T	0	T	0			M	78		
28	1/27/2014	2014	1	27	‡	-7.6		-14.7		-11.2		29.2		0		0		0		0		0			M	<31		
29	1/28/2014	2014	1	28	‡	6.3		-12.5		-3.1		21.1		0		0		0		0		0			M	44		
30	1/29/2014	2014	1	29	‡	2.8		-13.2		-5.2		23.2		0		0		6.4		3.2		0			M	43		
31	1/30/2014	2014	1	30	‡	-11.9		-17.4		-14.7		32.7		0		0		0	T	0	T	5			M	46		
32	1/31/2014	2014	1	31	‡	-7.2		-19.2		-13.2		31.2		0		0		0.2		0.2		5			M	50		
33	2/1/2014	2014	2	1	‡	-7.5		-17.5		-12.5		30.5		0		0		0		0		3			M	<31		
34	2/2/2014	2014	2	2	‡	-8.4		-15.5		-12		30		0		0		0	T	0	T	0			M	39		
35	2/3/2014	2014	2	3	‡	-12.1		-20.9		-16.5		34.5		0		0		3		1.7		0			M	50		
36	2/4/2014	2014	2	4	‡	-20.2		-23.1		-21.7		39.7		0		0		0.2		0.2		8			M	37		
37	2/5/2014	2014	2	5	‡	-20.2		-28.2		-24.2		42.2		0		0		0	T	0	T	4			M	<31		

Data

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB
1	Date/Time	Year	Month	Day	Data Qual	Max Temp	Max Temp	Min Temp	Min Temp	Mean Ten	Mean Ten	Heat Deg	Heat Deg	Cool Deg	Cool Deg	Total Rain	Total Rain	Total Snov	Total Snov	Total Prec	Total Prec	Snow on G	Snow on G	Dir of Max	Dir of Max	Spd of Ma	Spd of Max	Gust Flag
2	1/1/2014	2014	1	1	‡	-0.6		-9.7		-5.2		23.2		0		0		1		0.8		9			M	<31		
3	1/2/2014	2014	1	2	‡	8.5		-10		-0.8		18.8		0		0		0		0		11			M	52		
4	1/3/2014	2014	1	3	‡	3		-11		-4		22		0		0		7.8		5.8		8			M	54		
5	1/4/2014	2014	1	4	‡	-11		-21.9		-16.5		34.5		0		0		1		0.2		14			M	44		
6	1/5/2014	2014	1	5	‡	-14.4		-25.5		-20		38		0		0	T	0		0	T	14			M	52		
7	1/6/2014	2014	1	6	‡	3.4		-14.8		-5.7		23.7		0		0		0		0		10			M	33		
8	1/7/2014	2014	1	7	‡	-3		-9.9		-6.5		24.5		0		0		0	T	0	T	8			M	32		
9	1/8																											
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32	1/31																											
33	2/1																											
34	2/2																											
35	2/3																											
36	2/4																											
37	2/5																											

	A	B	C	D	E	F	G	H	I	J	K	L
1	Date/Time	Year	Month	Day	Data Qual	Max Temp	Max Temp	Min Temp	Min Temp	Mean Ten	Mean Ten	Heat Deg
2	1/1/2014	2014	1	1	‡	-0.6		-9.7		-5.2		23.2
3	1/2/2014	2014	1	2	‡	8.5		-10		-0.8		18.8
4	1/3/2014	2014	1	3	‡	3		-11		-4		22
5	1/4/2014	2014	1	4	‡	-11		-21.9		-16.5		34.5
6	1/5/2014	2014	1	5	‡	-14.4		-25.5		-20		38
7	1/6/2014	2014	1	6	‡	3.4		-14.8		-5.7		23.7
8	1/7/2014	2014	1	7	‡	-3		-9.9		-6.5		24.5
9	1/8/2014	2014	1	8	‡	5.8		-11.4		-2.8		20.8
10	1/9/2014	2014	1	9	‡	4.6		-6.8		-1.1		19.1
11	1/10/2014	2014	1	10	‡	2.2		-7.7		-2.8		20.8
12	1/11/2014	2014	1	11	‡	7.8		-9.9		-1.1		19.1
13	1/12/2014	2014	1	12	‡	2.5		-8.3		-2.9		20.9
14	1/13/2014	2014	1	13	‡	6		-5.9		0.1		17.9
15	1/14/2014	2014	1	14	‡	8.6		-8.3		0.2		17.8
16	1/15/2014	2014	1	15	‡	9		-0.3		4.4		13.6

Normalized Data

Crosstab Data (you don't want it shaped like this):

Net Income (millions of dollars)			
Company	2010	2009	2008
Citi Group	10602	-1606	-27684
General Electric	11644	11025	17410
Siemens AG	5554	3650	8504
Koninklijke Philips Electronic	1948	608	-262

While crosstabs make sense to people, it makes our software's head hurt because each row contains three pieces of data -- in this case the company's net income in 2010, 2009 and 2008. Tableau feels much more comfortable when data is in a normalized format, where each row contains only one net income figure.

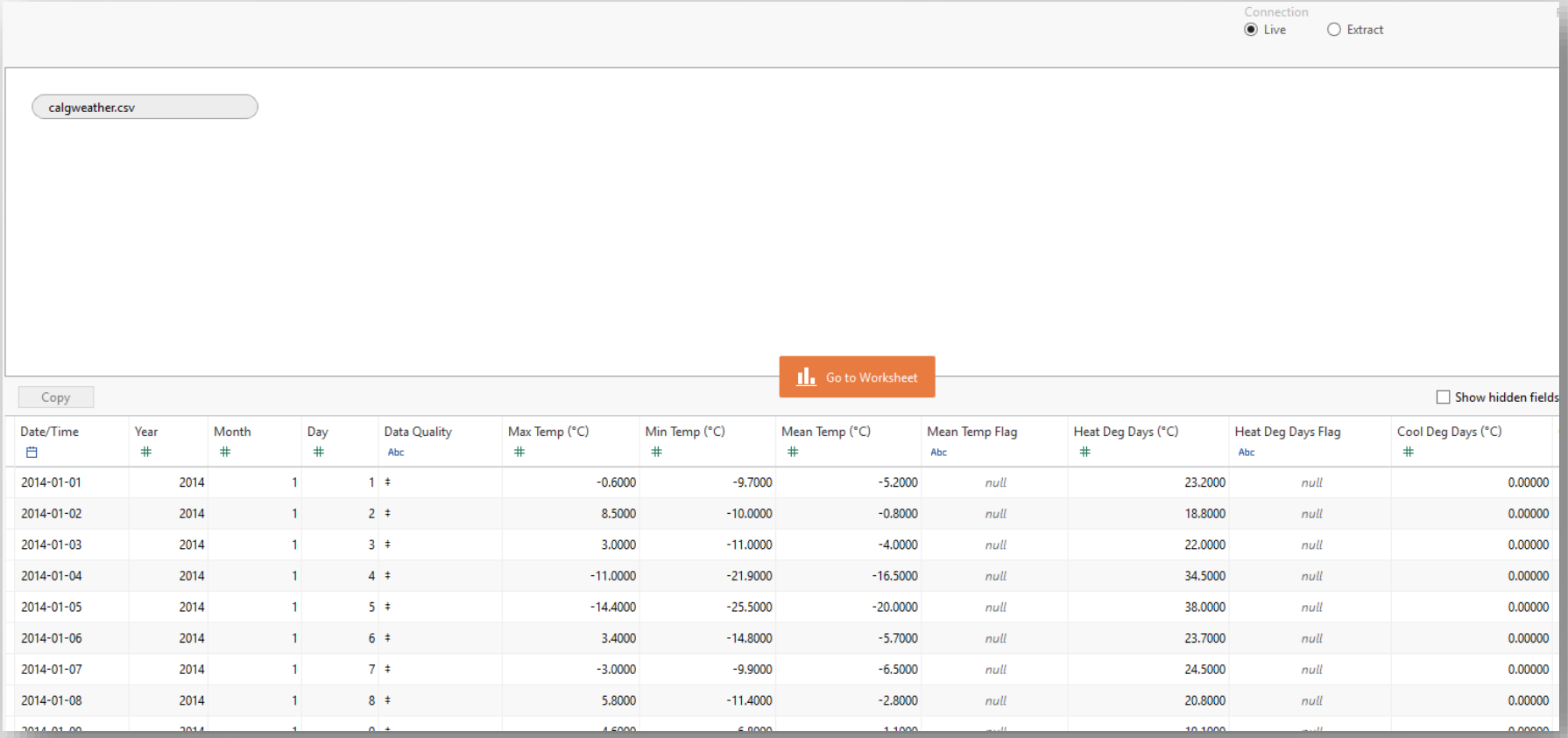
Normalized Data (you want your data shaped this way):

Company	Year	Net Income ($millions)
Citi Group	2010	10602
Citi Group	2009	-1606
Citi Group	2008	-27684
General Electric	2010	11644
General Electric	2009	11025
General Electric	2008	17410
Siemens AG	2010	5554
Siemens AG	2009	3650
Siemens AG	2008	8504
Koninklijke Philips Electronic	2010	1948
Koninklijke Philips Electronic	2009	608
Koninklijke Philips Electronic	2008	-262

Data Types

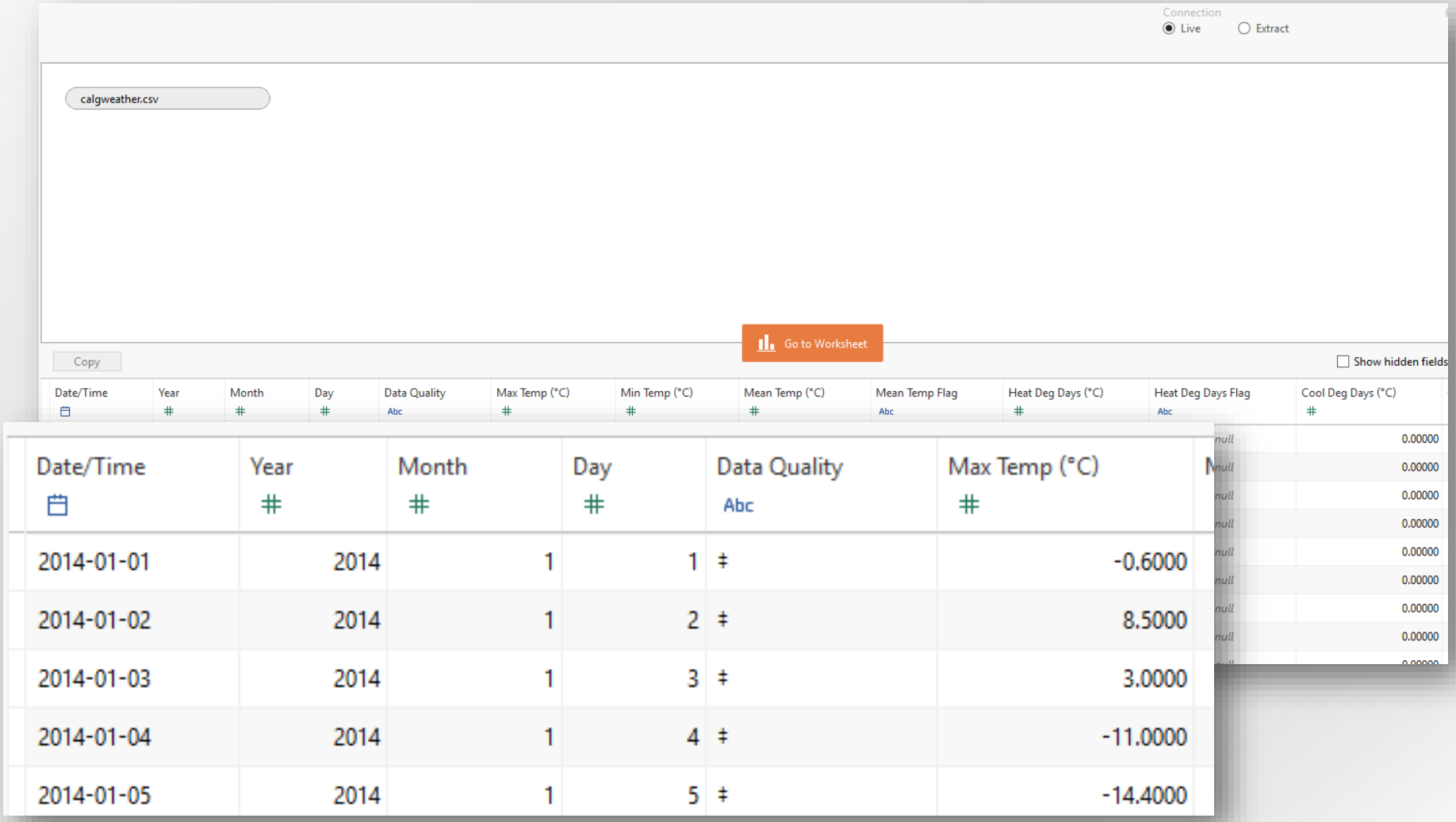
- Numbers
- Text
- Dates
- Times
- Geography (attempts to automatically recognize)
  - Latitude & Longitude
  - Country
  - City
  - Phone area codes
  - Postal codes (first three digits)

Data

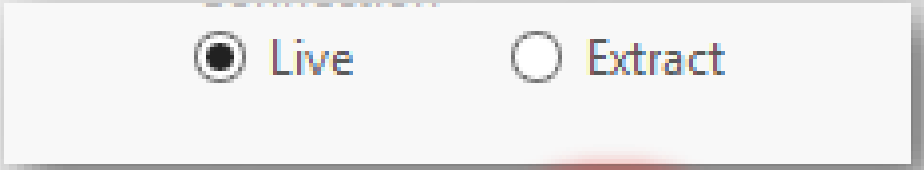


Date/Time	Year	Month	Day	Data Quality	Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)	Mean Temp Flag	Heat Deg Days (°C)	Heat Deg Days Flag	Cool Deg Days (°C)
2014-01-01	2014	1	1	ǂ	-0.6000	-9.7000	-5.2000	null	23.2000	null	0.00000
2014-01-02	2014	1	2	ǂ	8.5000	-10.0000	-0.8000	null	18.8000	null	0.00000
2014-01-03	2014	1	3	ǂ	3.0000	-11.0000	-4.0000	null	22.0000	null	0.00000
2014-01-04	2014	1	4	ǂ	-11.0000	-21.9000	-16.5000	null	34.5000	null	0.00000
2014-01-05	2014	1	5	ǂ	-14.4000	-25.5000	-20.0000	null	38.0000	null	0.00000
2014-01-06	2014	1	6	ǂ	3.4000	-14.8000	-5.7000	null	23.7000	null	0.00000
2014-01-07	2014	1	7	ǂ	-3.0000	-9.9000	-6.5000	null	24.5000	null	0.00000
2014-01-08	2014	1	8	ǂ	5.8000	-11.4000	-2.8000	null	20.8000	null	0.00000

Data


Connection
Live
Extract
calgweather.csv
Go to Worksheet
Copy
Show hidden fields
Date/Time
Year
Month
Day
Data Quality
Max Temp (°C)
Min Temp (°C)
Mean Temp (°C)
Mean Temp Flag
Heat Deg Days (°C)
Heat Deg Days Flag
Cool Deg Days (°C)
2014-01-01 2014 1 1 -0.6000
2014-01-02 2014 1 2 8.5000
2014-01-03 2014 1 3 3.0000
2014-01-04 2014 1 4 -11.0000
2014-01-05 2014 1 5 -14.4000

Data



Connection
Live Extract

calgweather.csv

Go to Worksheet

Copy

Show hidden fields

Date/Time	Year	Month	Day	Data Quality	Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)	Mean Temp Flag	Heat Deg Days (°C)	Heat Deg Days Flag	Cool Deg Days (°C)
2014-01-01	2014	1	1	ǂ	-0.6000	-9.7000	-5.2000	null	23.2000	null	0.00000
2014-01-02	2014	1	2	ǂ	8.5000	-10.0000	-0.8000	null	18.8000	null	0.00000
2014-01-03	2014	1	3	ǂ	3.0000	-11.0000	-4.0000	null	22.0000	null	0.00000
2014-01-04	2014	1	4	ǂ	-11.0000	-21.9000	-16.5000	null	34.5000	null	0.00000
2014-01-05	2014	1	5	ǂ	-14.4000	-25.5000	-20.0000	null	38.0000	null	0.00000
2014-01-06	2014	1	6	ǂ	3.4000	-14.8000	-5.7000	null	23.7000	null	0.00000
2014-01-07	2014	1	7	ǂ	-3.0000	-9.9000	-6.5000	null	24.5000	null	0.00000
2014-01-08	2014	1	8	ǂ	5.8000	-11.4000	-2.8000	null	20.8000	null	0.00000

Follow Along Demo

- Make line chart with Calgary weather data here; Max Temp and Date.
- Start by pointing out how Tableau has aggregated the data
- Highlight how to move from years to day-by-day
- Move to a dual axis line chart by adding Min Temp. Show how to synchronize axes.

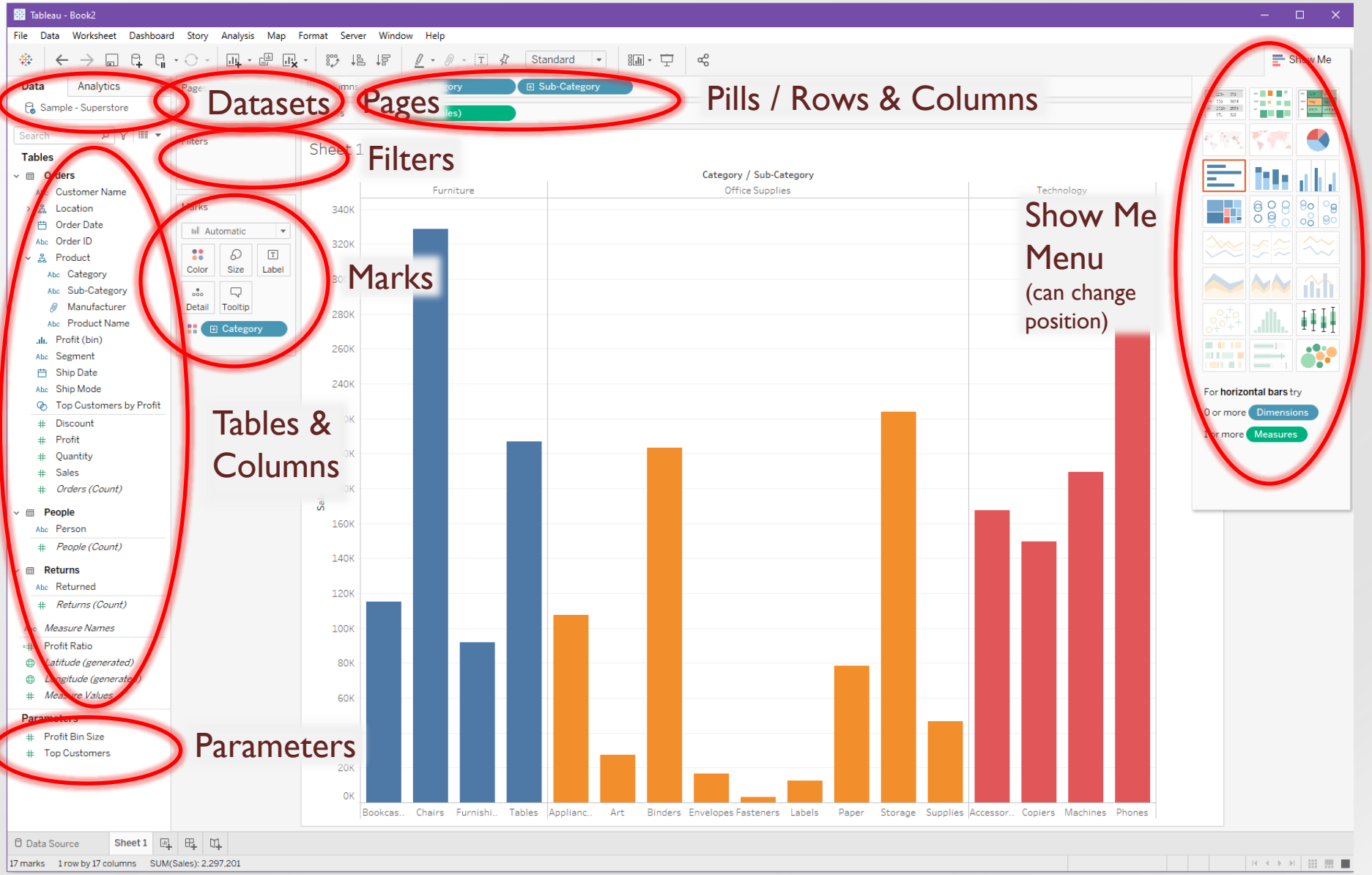


Tableau - Book2
File Data Worksheet Dashboard Story Analysis Map Format Server Window Help
Standard
Show Me
Data
Analytics
Sample - Superstore
Datasets
Pages
Pill
Pills / Rows & Columns
Filters
Sheet 1
Filters
Tables
Orders
Customer Name
Location
Order Date
Order ID
Product
Category
Sub-Category
Manufacturer
Product Name
Profit (bin)
Segment
Ship Date
Ship Mode
Top Customers by Profit
Discount
Profit
Quantity
Sales
Orders (Count)
People
Person
People (Count)
Returns
Returned
Returns (Count)
Measure Names
Profit Ratio
Latitude (generated)
Longitude (generated)
Measure Values
Tables & Columns
Marks
Automatic
Color
Size
Label
Detail
Tooltip
Category
Marks
Category / Sub-Category
Furniture
Office Supplies
Technology
340K
320K
280K
260K
240K
160K
140K
120K
100K
80K
60K
0K
Bookcas..
Chairs
Furnishi..
Tables
Applianc..
Art
Binders
Envelopes
Fasteners
Labels
Paper
Storage
Supplies
Accessor..
Copiers
Machines
Phones
Show Me Menu
(can change position)
For horizontal bars try
0 or more Dimensions
1 or more Measures
Parameters
Profit Bin Size
Top Customers
Data Source
Sheet 1
17 marks
1 row by 17 columns
SUM(Sales): 2,297,201

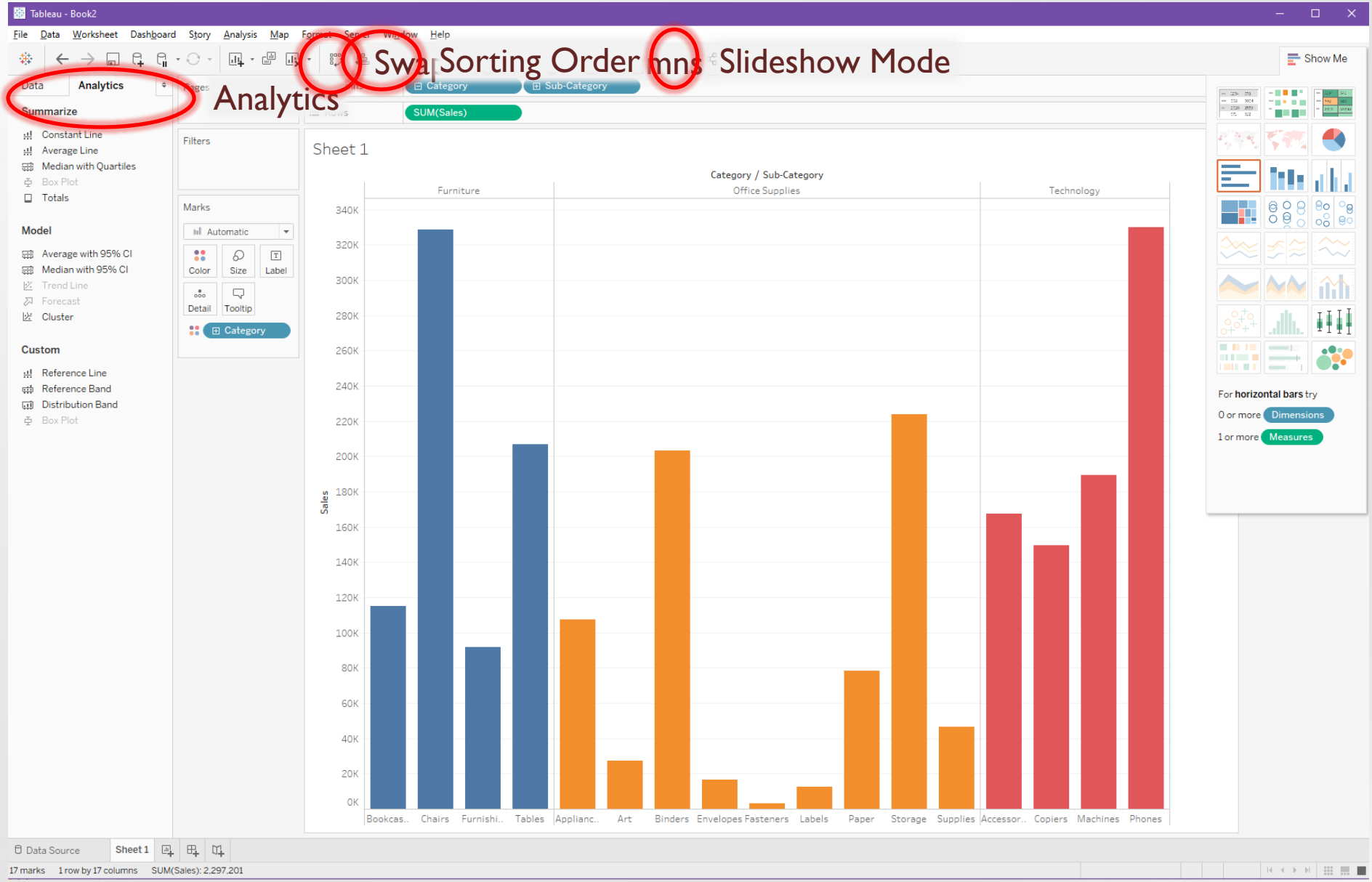


Tableau - Book2
File Data Worksheet Dashboard Story Analysis Map Format Server Window Help
Swap Rows and Columns
Sorting Order
Slideshow Mode
Show Me
Data
Analytics
Analytics
Summarize
Constant Line
Average Line
Median with Quartiles
Box Plot
Totals
Model
Average with 95% CI
Median with 95% CI
Trend Line
Forecast
Cluster
Custom
Reference Line
Reference Band
Distribution Band
Box Plot
Pages
Filters
Marks
Automatic
Color
Size
Label
Detail
Tooltip
Category
Columns
Category
Sub-Category
Rows
SUM(Sales)
Sheet 1
Category / Sub-Category
Furniture
Office Supplies
Technology
Sales
340K
320K
300K
280K
260K
240K
220K
200K
180K
160K
140K
120K
100K
80K
60K
40K
20K
0K
Bookcas..
Chairs
Furnishi..
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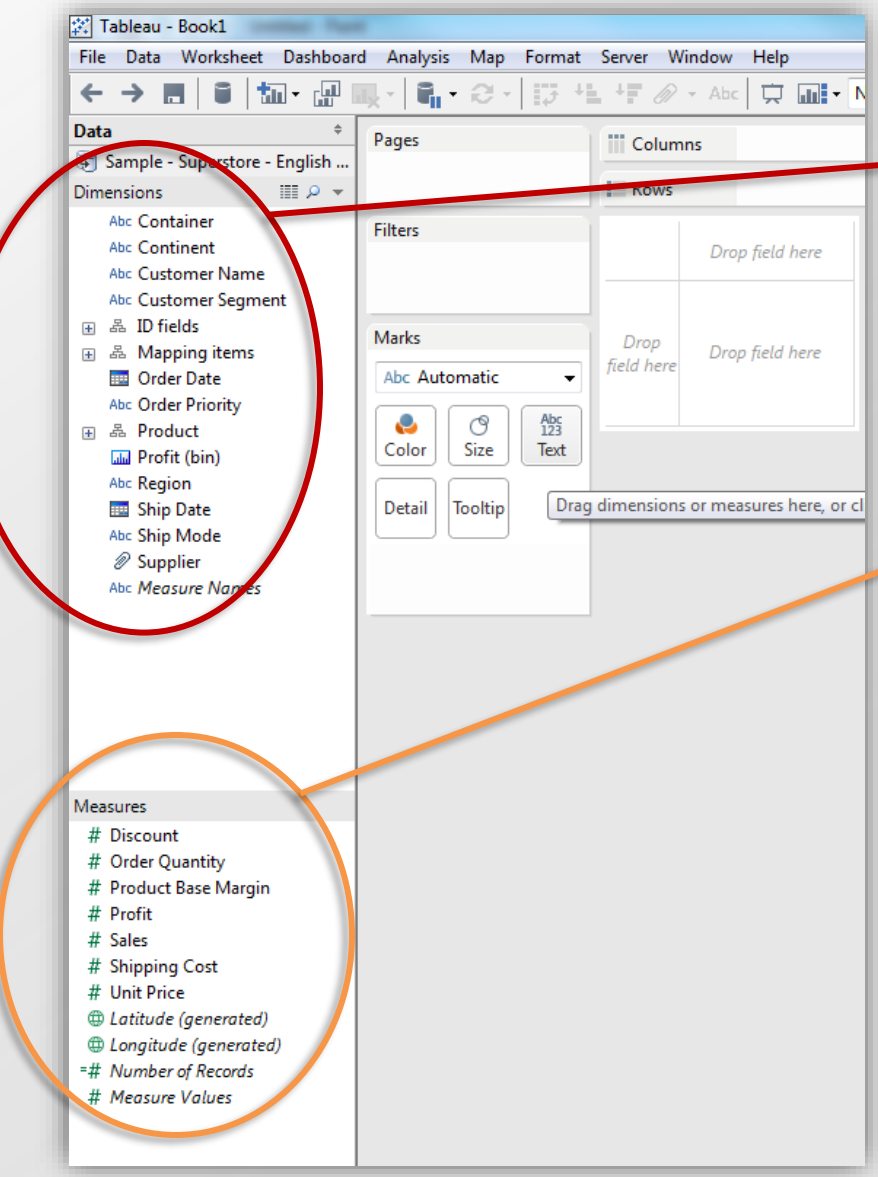
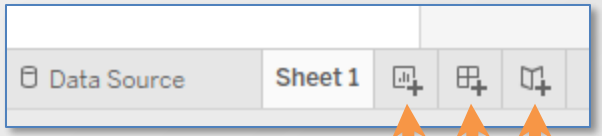


- Dimensions:
  - These are items that we might want to categorize our data by.
- Measures:
  - The numbers & metrics that we want to analyze.



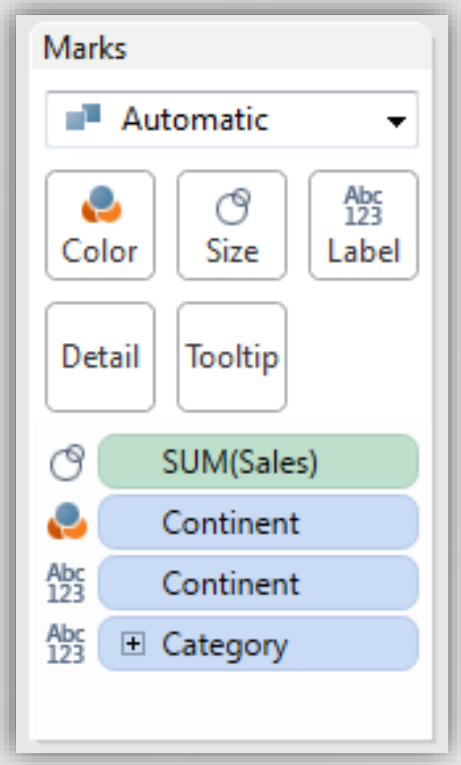
- Worksheet
  - A single visualization. Drag data to rows and columns to get started
- Dashboard
  - A display created by combining one or more worksheets
- Story
  - A sequence of worksheets to tell a story

Pick a Visualization

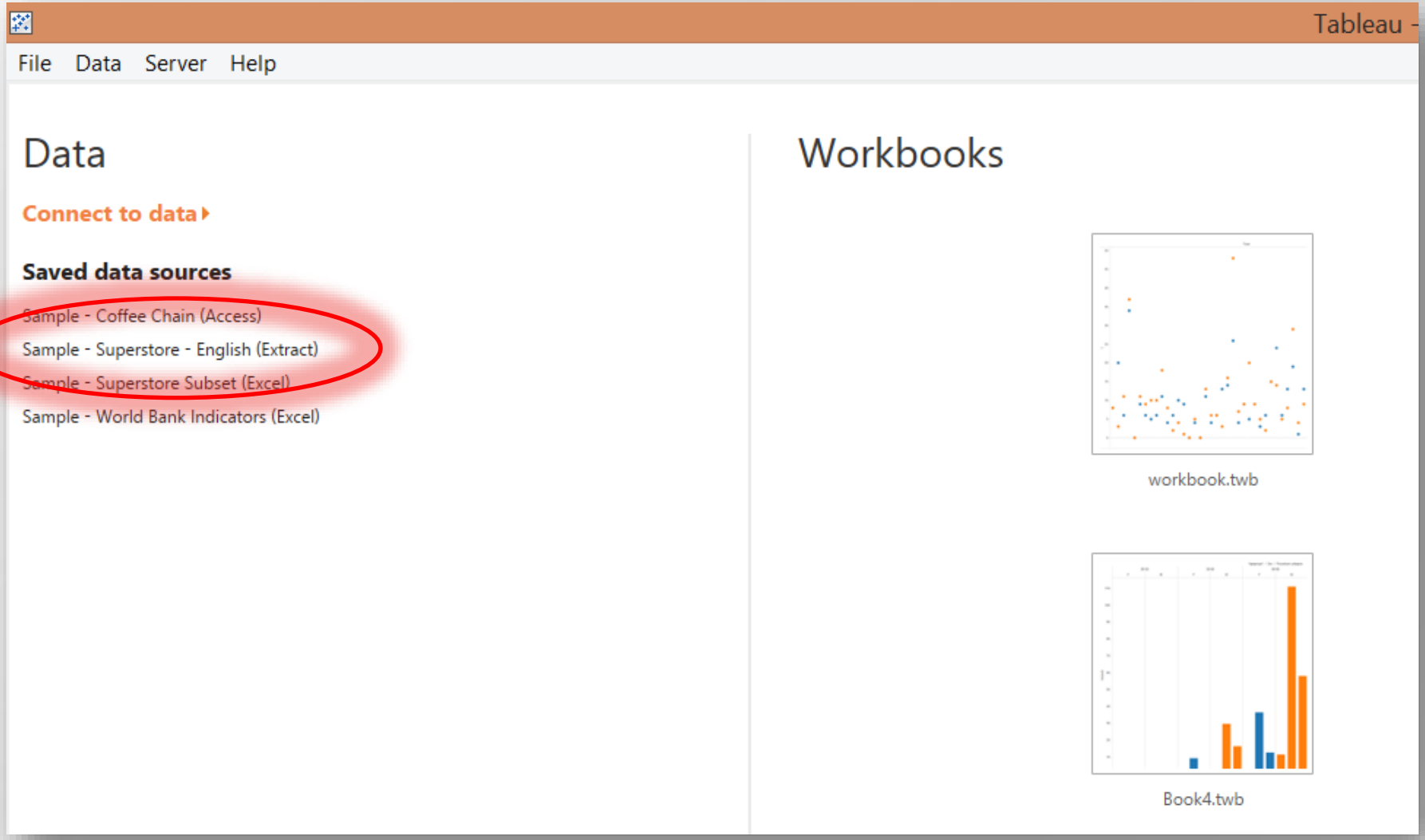
- *Show Me Window*
- Highlights valid alternatives
- Also can Ctrl-click dimensions & measures to get "Show Me" alternatives

Marks

- Map measure/dimension to different type of visual variable
  - Color/shade (when categorical vs ordered)
  - Size
  - Label
  - Detail
  - Tooltip
- Click to customize each element



Visualizations



Follow Along Demo

- Bar Chart
  - Category & Sales
  - Add subcategory
  - Color by category
  - Color by profit
- Treemap
  - Start by encouraging everyone to explore different chart types with the show me menu
  - Then move to the treemap entry
  - Add more labels
  - Highlight how pills appear in the marks menu to show you how size, color, labels, etc are being used.

Fellow Along Demo

- Map
  - Use state/province and sales
  - Selected the filled map
  - Again add labels for state names
  - Add an interactive filter for subcategory
    - Show how to change the filter widget to dropdown, radio buttons, etc
- Scatterplot
  - Sales and profits
  - Point out aggregation again
  - Show how detail entry in marks works to break up the aggregation
  - Adjust colors, shapes, etc.
- Dashboard
  - Quickly throw all the previous examples onto one dashboard
  - Show how to get filter widget to apply to all worksheets
  - Show how to use “funnel” button to make worksheets into interactive filters for the rest of the dashboard

Visualizations

make sure we covered all of these items

- Drag & drop
  - Order Date (columns) & # of Records (rows)
- See your data (details & table)
- Tableau likes to add things up
- Menus / little triangles
- Forward / back buttons
- Break down dates

Output

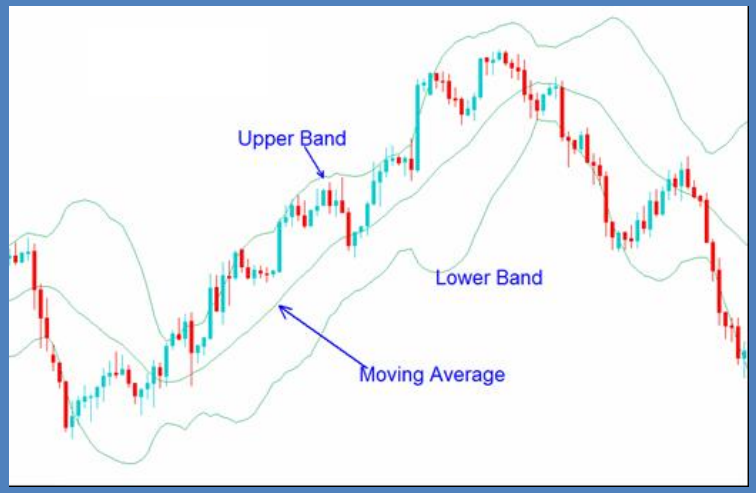
- PDF / Powerpoint / Image
- Tableau workbook (can be read in Tableau Reader)
- Create an interactive webpage
  - Public
  - Server license

Calculated Field:

Bollinger Bands

Data: http://brosz.ca/slides/tableau/apple%20stock.csv

Bollinger Bands



Add data file (Apple)

[Adj Close] for the rows
[Date] for the columns

Create moving average calculated field for the "center" line

window_avg(avg([Close]),-[Period],0)

Use the moving average of the standard deviation calculated field to create "upper" and "lower" lines

window_stdev(avg([Close]),-[Period],0)

More Info

Training Videos

- http://www.tableau.com/learn/training
- https://www.linkedin.com/learning/
  (free month, also available through Calgary Public Library)

Tableau Visualization of the Day

- https://public.tableau.com/app/discover/viz-of-the-day

BOOK

Tableau cookbook - recipes for data visualization : create beautiful data visualizations and interactive dashboards with Tableau

Sankhe-Savale, Shweta, author.

2016; 1st edition

Online access

BOOK

Mastering Tableau 2019. 1 : an expert guide to implementing advanced business intelligence and analytics with Tableau 2019. 1

Meier, Marleen, author.

2019; Second edition.

Online access

BOOK

Tableau : creating interactive data visualizations : illustrate your data in a more interactive way by implementing data visualization principles and creating visual stories using Tableau : a course in three modules

Stirrup, Jen, author.

2016; 1st edition

Online access

BOOK

Practical Tableau : 100 tips, tutorials, and strategies from a Tableau zen master

Sleeper, Ryan, author.

2018; First edition.

Online access

BOOK

Visual analytics with Tableau

Loth, Alexander, author.

2019; 1st edition

Online access

LIBRARY.UCALGARY.CA – search for TABLEAU VISUALIZATION

Slides & data: brosz.ca/slides/tableau

Questions

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