

Date and time functions

CALCULATIONS IN TABLEAU



Maarten Van den Broeck

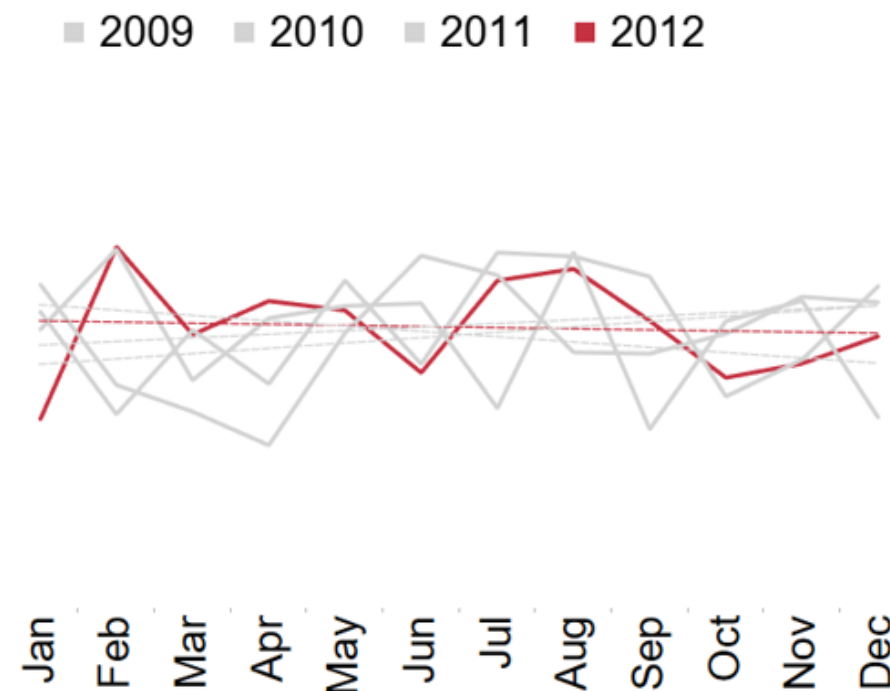
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What is time series analysis?

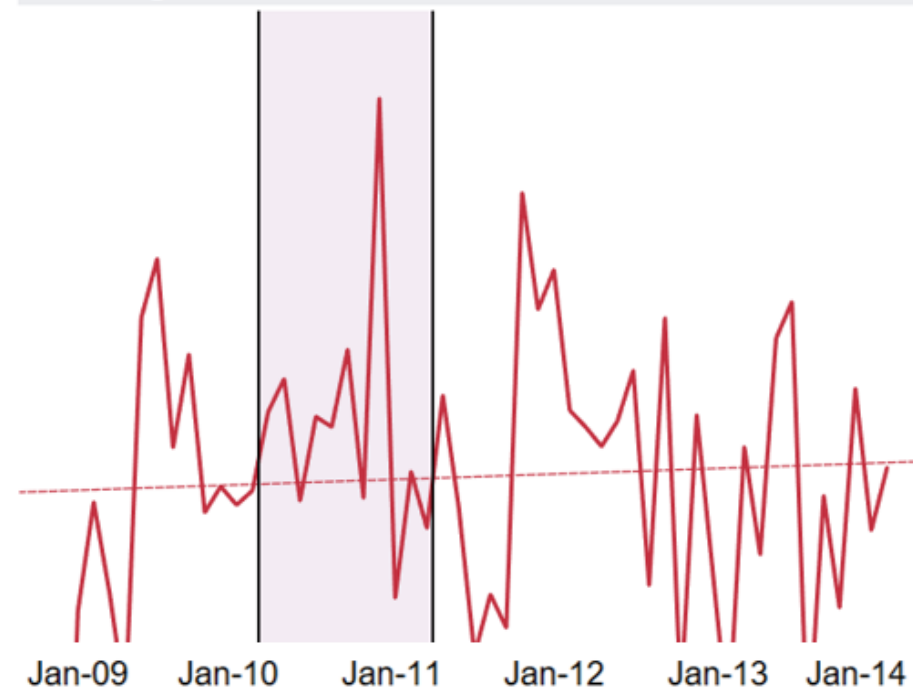
Time series analysis - study of data in particular periods or intervals, which often includes trend analysis, seasonal comparisons of data and study of rolling time-periods

- Examples of time series analysis:

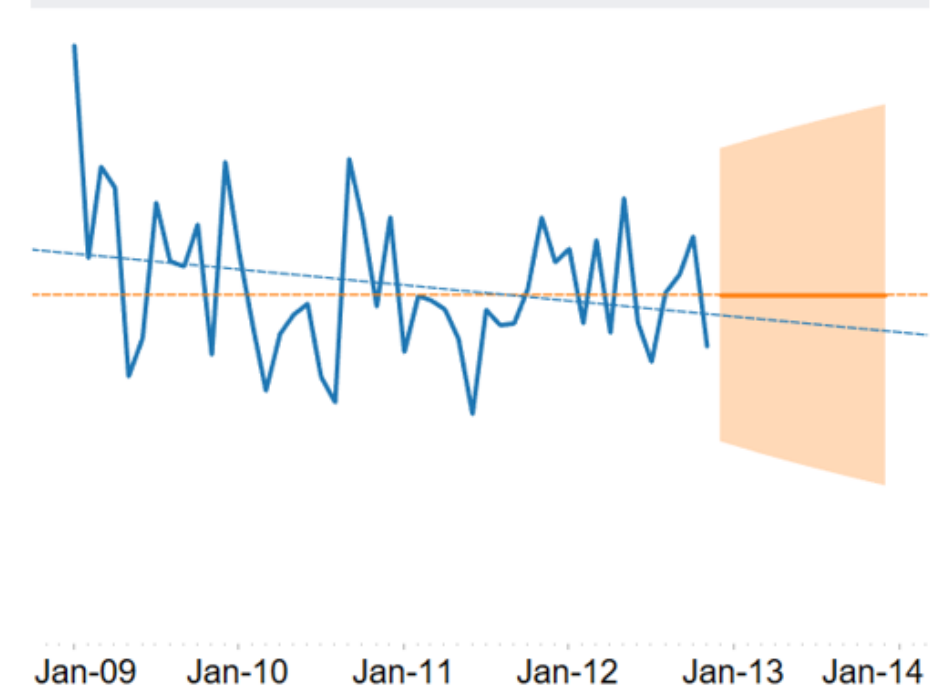
Sales seasonality



Rolling 3-months sales



Volume forecast




Date and time as data types

Date or DateTime data types:

- Data type storing calendar date/time
- May be auto-recognized by Tableau
- Dependent on data locale (1)
- Represented in Tableau with calendar symbol:

 Date

 DateTime

Date can have various *output* formats:

- 21-Jan-2020
- Monday, 31. December 19
- 31/10/12
- 10/31/12
- jan.22
- 2022-W05
- ...

¹ Data locale: set of parameters describing the user's language & region settings.

Deriving Date(Time) from other columns

Example:

Year	Month	Day
2022	3	1
2019	5	28
2023	2	6

Hour	Minute	Second
5	2	0
6	59	59
8	12	10

Year	Month	Day	Hour	Minute	Second
2022	3	1	5	2	0

`MakeDate ([Year], [Month], [Day])`

 **Date** 01 March 2022

`MakeTime ([Hour], [Minute], [Second])`

 **Time** 05:02:00

`MakeDateTime ([Date], [Time])`

 **DateTime** 01 March 2022 05:02:00

Parsing dates

Parsing: analyzing a string into logical syntactic components

Example:

Transaction_date
2022-03-29 07:23:02 AM

DateParse (format, string)

```
DATEPARSE('YYYY-MM-dd HH:mm:ss aa', [Transaction date])
```

 Transaction date 2022-03-29 07:23:02 AM

 Transaction date 2022-03-29 07:23:02 AM

Extracting date parts

Extracting a discrete year, but also possible with *quarter*, *month*, *day*, *dayofyear*, *weekday*, *hour*, *minute*, etc.

Example:

```
DATEPART ( 'year', [Order Date] )
```

```
DATEPART ( 'quarter', [Order Date] )
```

⊕ YEAR(Order Date)

Year of Order Date
2009
2010

⊕ QUARTER(Order D..

Quarter of Order Date
Q1
Q2

Truncating dates

Truncating: shortening, cutting

Truncating the specified date to the accuracy specified by the date part.

```
DATETRUNC ( 'month', #2022-06-15# )
```

```
DATETRUNC ( 'quarter', #2022-06-15# )
```

DAY(DateTrunc)

Day of DateTrunc

1 June 2022

QUARTER(DateTru..

Quarter of DateTrunc

Q2

Calculating with dates

Adding intervals to dates:

```
DATEADD (date_part, interval, [Date])
```

- Adds specified amount of intervals (e.g., 3 months, 2 days, 10 weeks, etc.) to the date

Subtracting intervals from dates:

```
DATEDIFF ( date_part, date1, date2 )
```

- Returns the difference between two dates, expressed in requested date part intervals

E.g.

- `DATEADD ('month', 3, [Date])`
- `DATEADD ('week', 10, [Date])`
- Returns a **date**

E.g.

- `DATEDIFF ('month', [Start], [End])`
- `DATEDIFF ('day', [Start], [End])`
- Returns a **number**

Referring to a date in a calculation

Using hard-coded dates in calculations:

Enclose the date value between # #

E.g. #2010-12-31#

```
IF [Order Date]> #2010-12-31# then [Sales] END
```

Year of Order Date	Sales
2009	€ 4,209K
2010	€ 3,550K
2011	€ 3,437K
2012	€ 3,720K

Year of Order Date	Sales	Sales as of 2011
2009	€ 4,209K	
2010	€ 3,550K	
2011	€ 3,437K	€ 3,437K
2012	€ 3,720K	€ 3,720K

Let's practice!

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Date and time in practice

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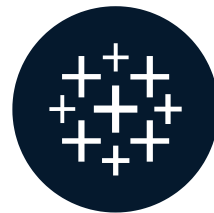
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Let's practice!

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Time series analysis

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Seasonality and year-over-year analysis

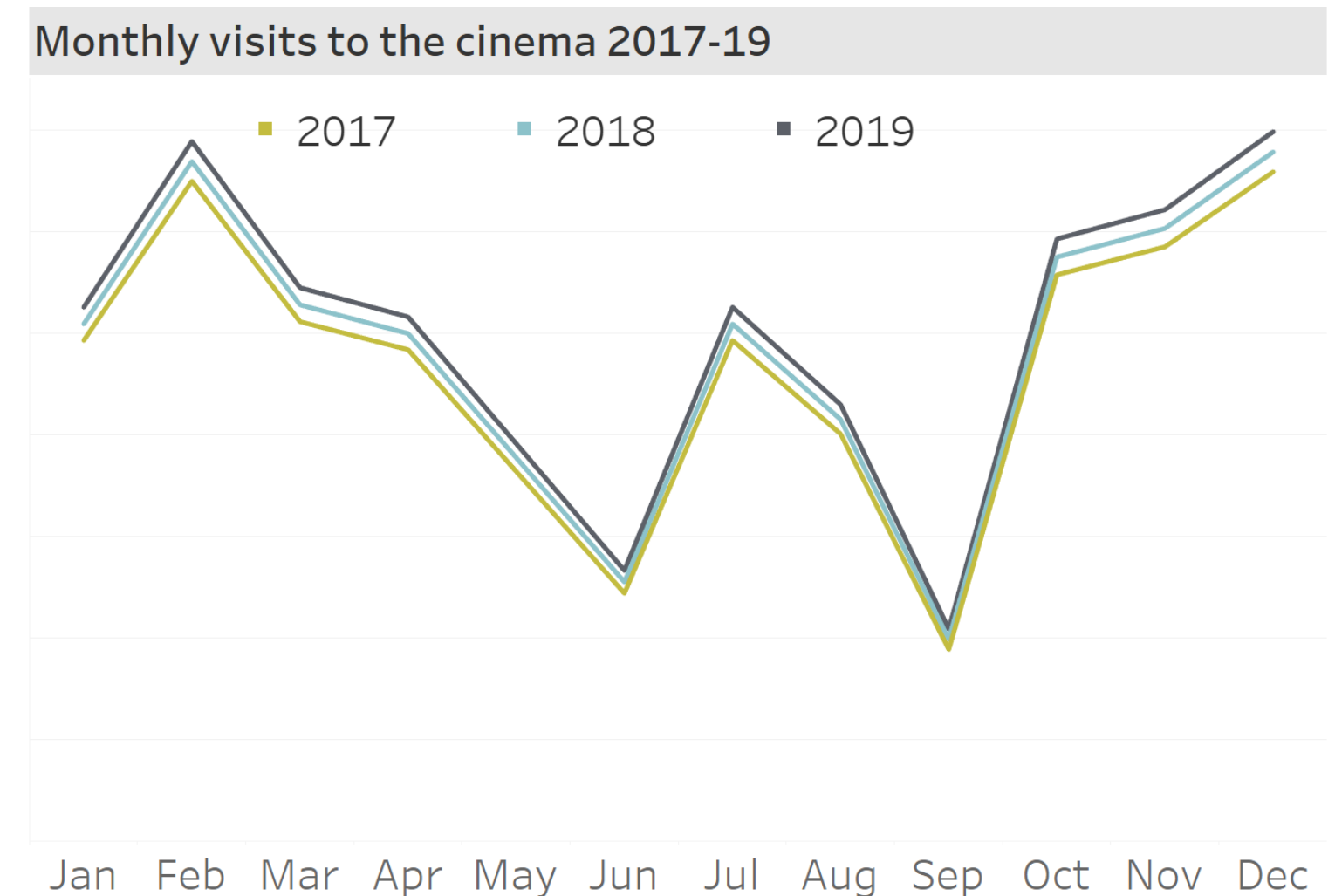
Study of repetitive patterns in data

- Detect predictable trends
- Determine high and low seasons
- Improve forecasting decisions

Year-over-year comparison:

- Comparison of results per discrete date intervals (e.g., months) across various years.

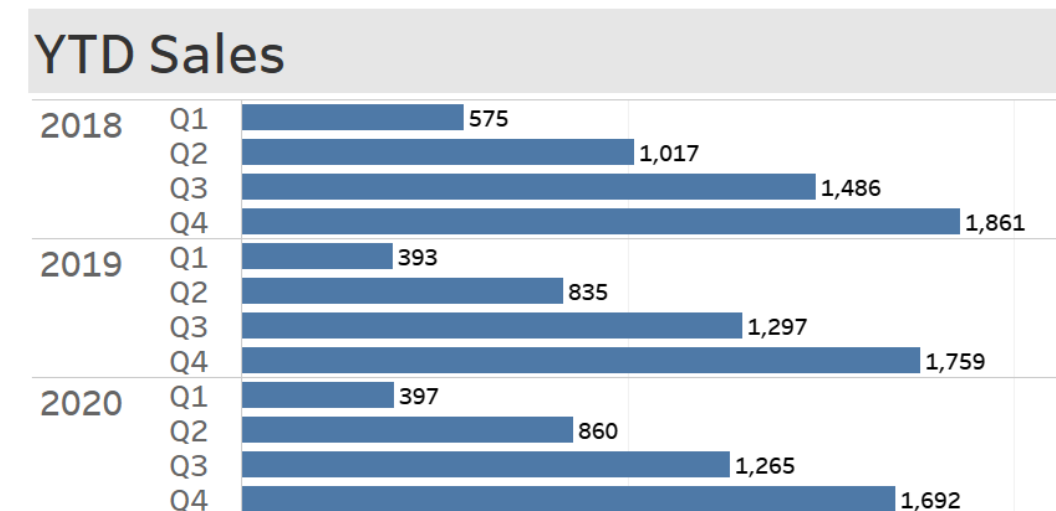
Seasonality of cinema visits, year-over-year:



Year-to-date and custom fiscal years

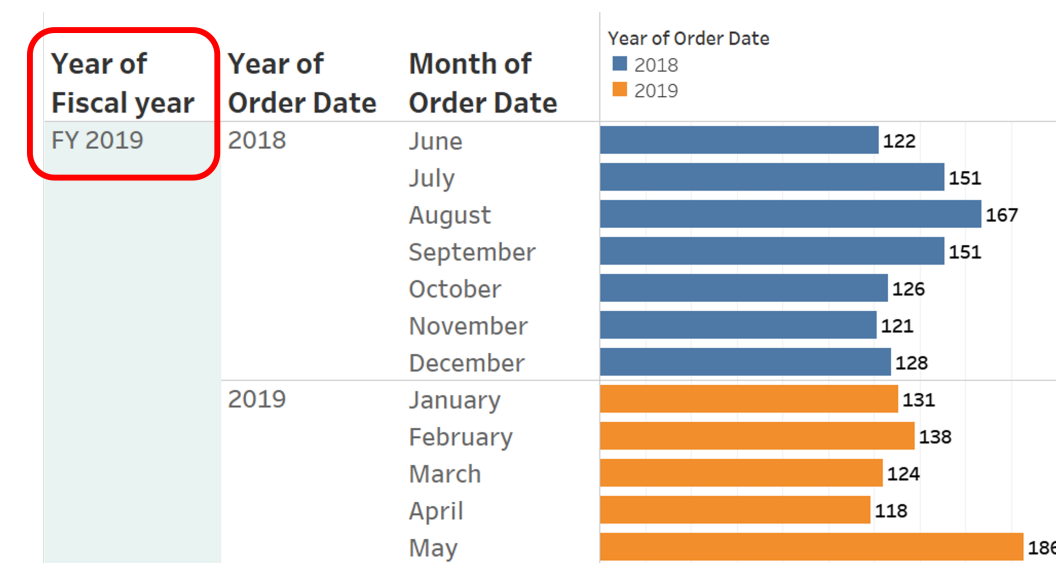
Year-to-date (YTD):

- A Quick Table Calculation
- Calculates from the start of the year to the last known data point in that year
- Also possible as MTD, QTD etc.



Custom Fiscal Year

- Built-in date property
- Possible to work with various year types in one workbook



Calculating growth

Year over Year Growth :

- A Quick Table Calculation
- Comparing change in a measure to the same period last year (e.g. Q1'19 to Q1'18)
- Requires discrete date dimensions

Calculation behind YoY growth:

```
(SUM([Sales]) - LOOKUP(SUM([Sales]), -1))  
  
/  
  
ABS(LOOKUP(SUM([Sales]), -1))
```

- Table (down) calculation

Year over Year Growth in Tableau:

Year-over-year growth per Quarter

	Q1	Q2
2018	575,333	441,540
2019	392,631	442,019
2020	396,923	463,477
2021	442,204	456,686

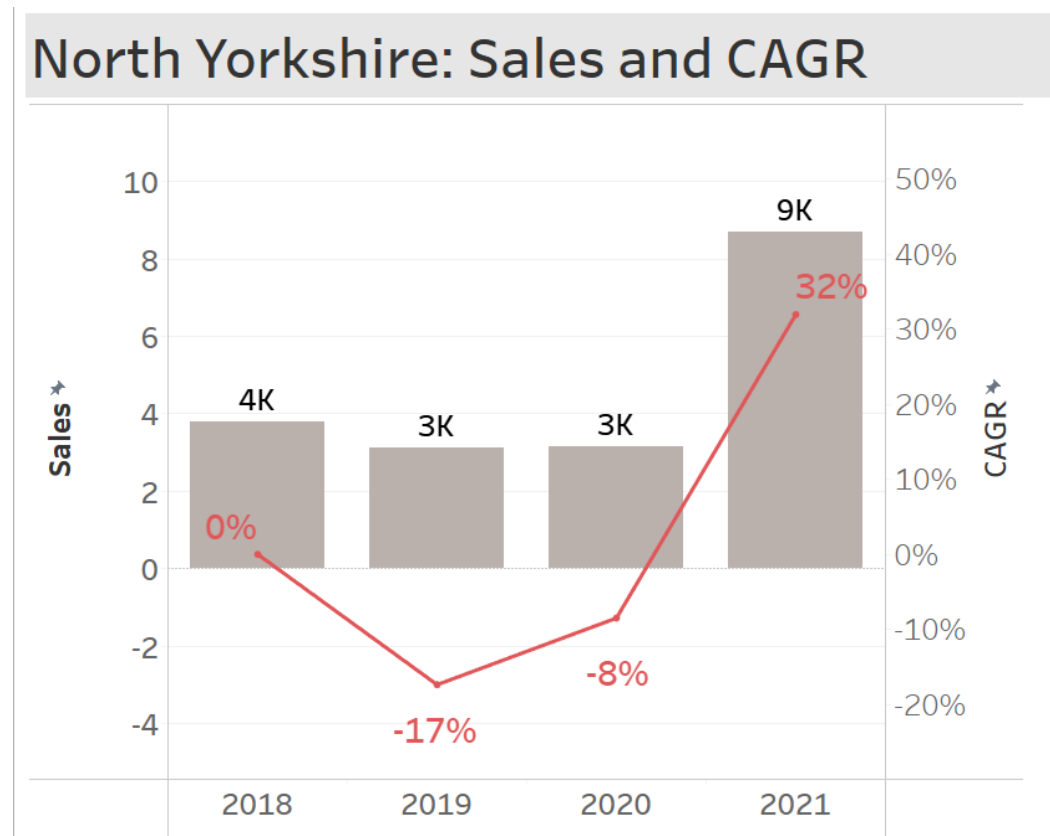
-32%	0%
1%	5%
11%	-1%

Compound Annual Growth Rate - CAGR

CAGR - mean annual growth rate of a measure over a specified period of time longer than one year (1)

CAGR as a mathematical calculation:

$$\text{CAGR} = \left(\frac{V_{\text{final}}}{V_{\text{begin}}} \right)^{1/t} - 1$$



CAGR in Tableau:

```
POWER (
  ZN (SUM ([Sales])) / LOOKUP (ZN (SUM ([Sales])), FIRST ())
  , ZN (1 / (INDEX () - 1))
) - 1
```

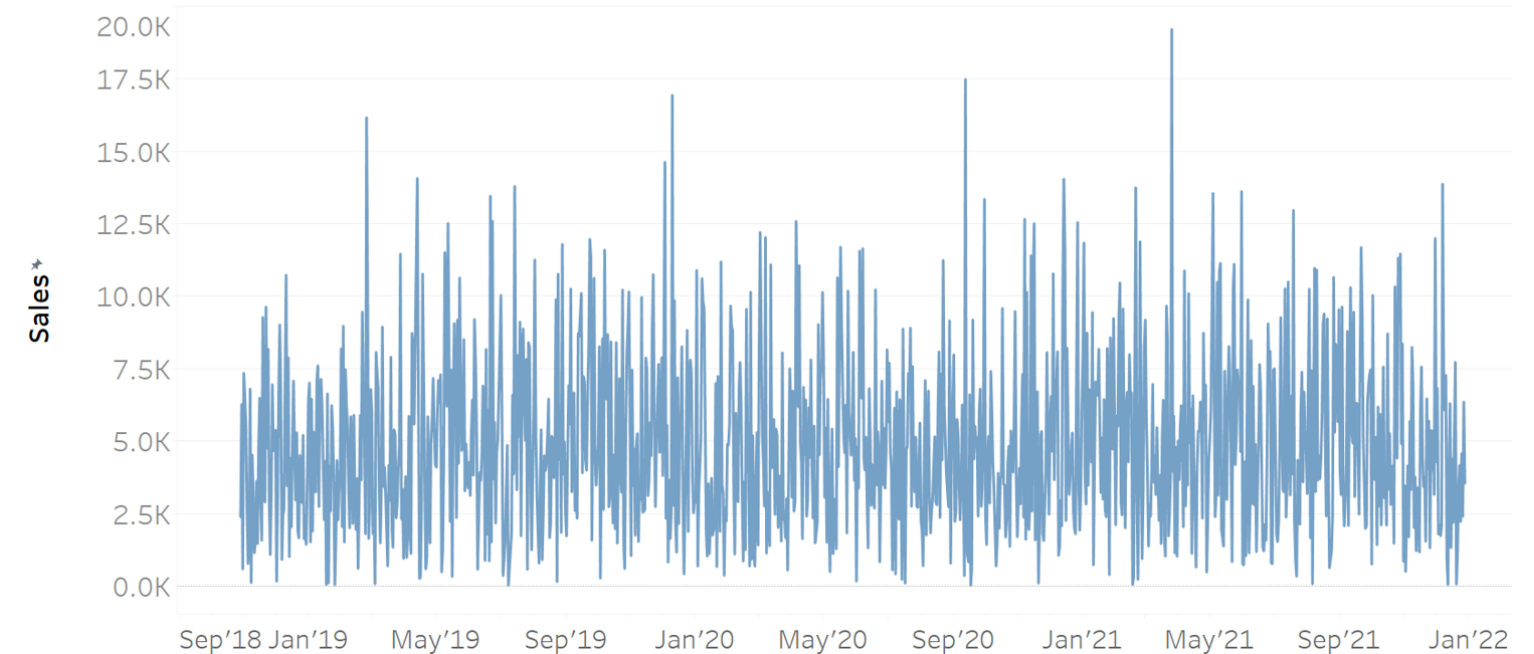
¹ <https://www.investopedia.com/investing/compound-annual-growth-rate-what-you-should-know/>

Moving (rolling) calculations

- Calculations across a specified number of values before and/or after the determined point in time
- Used for smoothing fluctuations in data
- Used for the long-term trends ("The Big Picture")

Smoothing fluctuations with moving average

Daily Sales



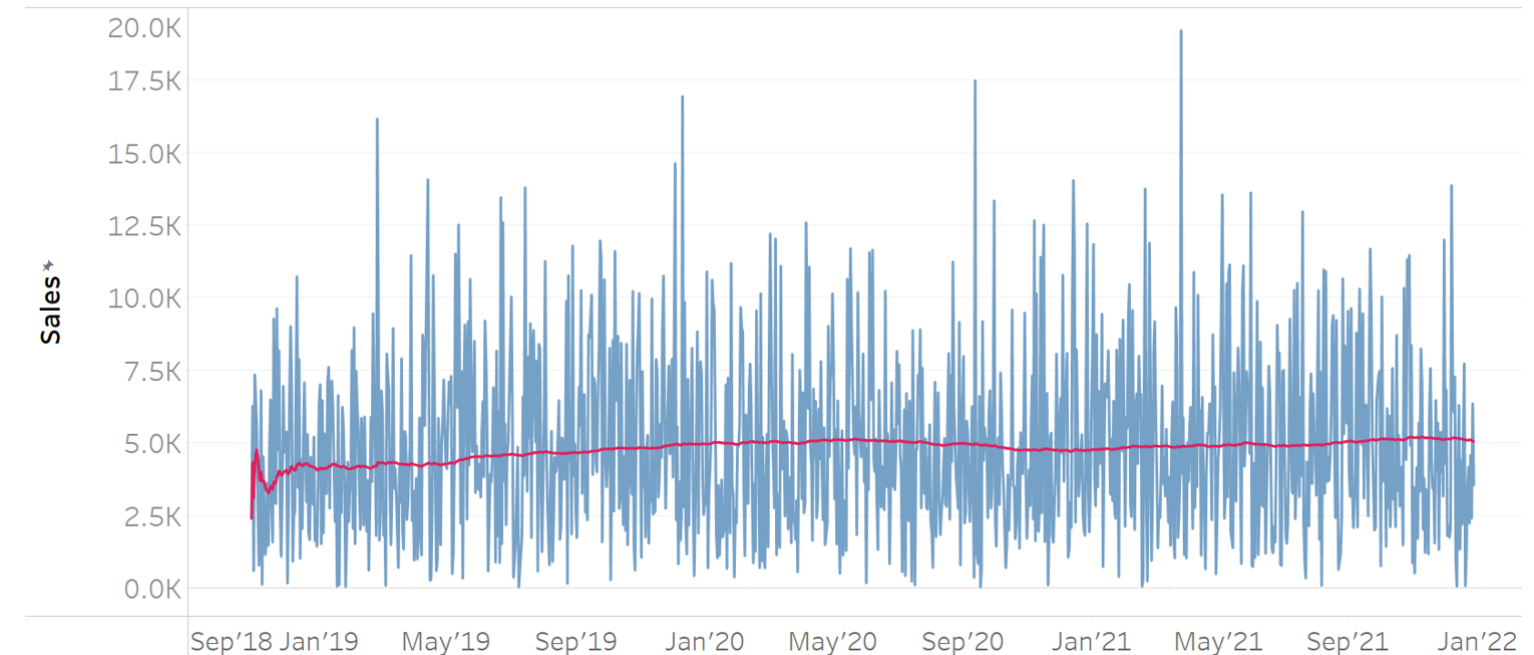
Moving (rolling) calculations

- Calculations across a specified number of values before and/or after the determined point in time
- Used for smoothing fluctuations in data
- Used for the long-term trends ("The Big Picture")
- E.g., moving `AVG(Sales)` over the last 180 days

```
WINDOW_AVG(SUM([Sales]), -180, 0)
```

Smoothing fluctuations with moving average

Daily Sales and 180-days moving average of sales

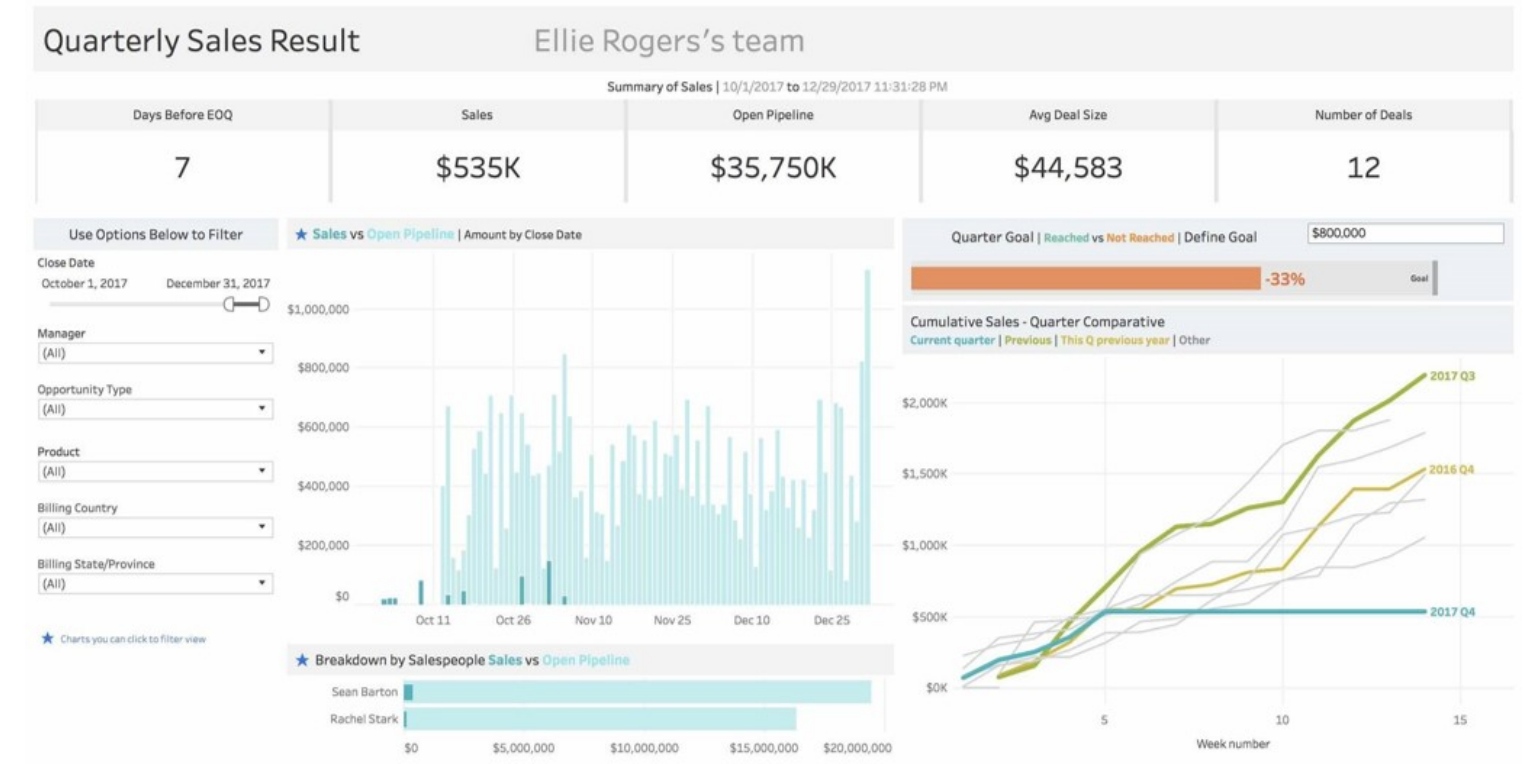


Keeping it organized

Visualizing complex calculations:

- Combine a set of time-series visualizations into a dashboard
- Work with parameters and highlighters
- Hide extra information (e.g. formula definition) in a tooltip
- Use Dual Axis sparingly with clear axis names

Example of a time-series dashboard



¹ <https://www.tableau.com/products/accelerators>

Let's practice!

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Time series analysis in practice

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Let's practice!

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Congratulations!

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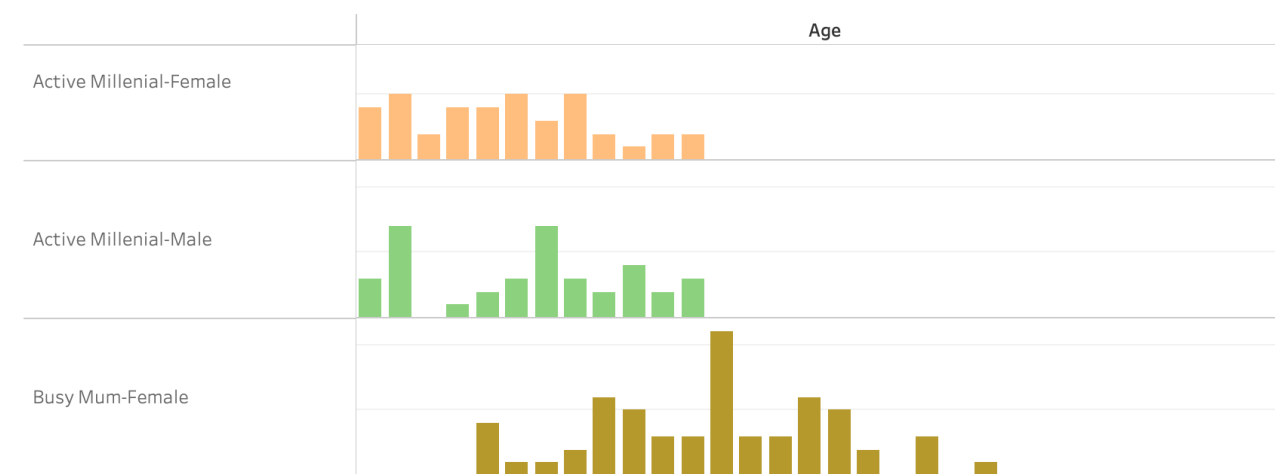


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Senior Data Analyst, Telenet

Chapter 1

- Calculations foundations
- Various calculation types
- Troubleshooting most common errors
- String and logic functions

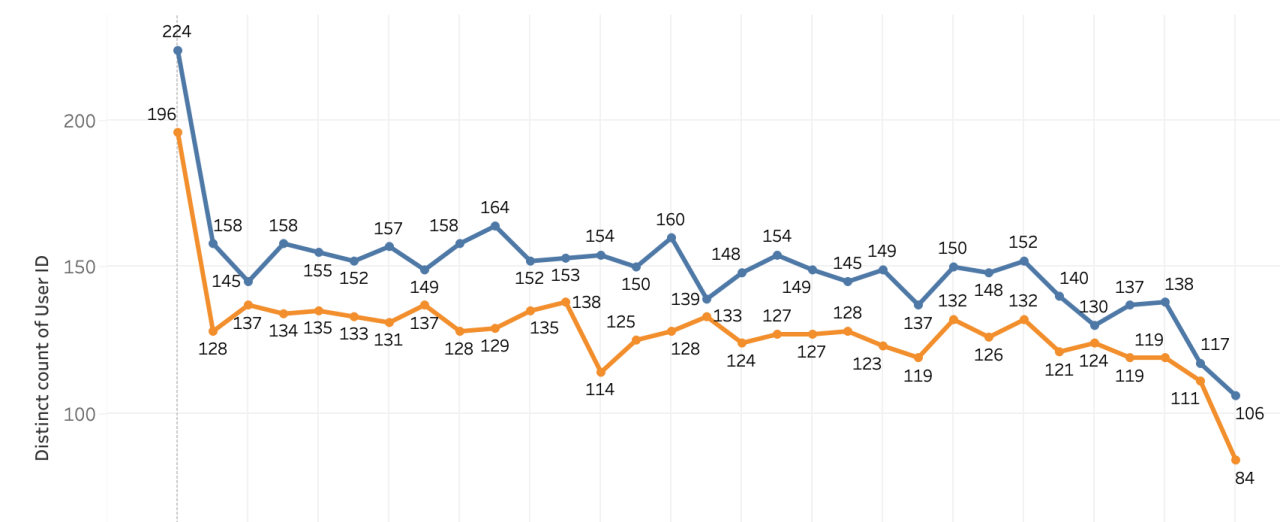
String operations



Chapter 2

- Navigating data granularity
- Level of Detail expressions
- Calculating independently of dimensions in the view

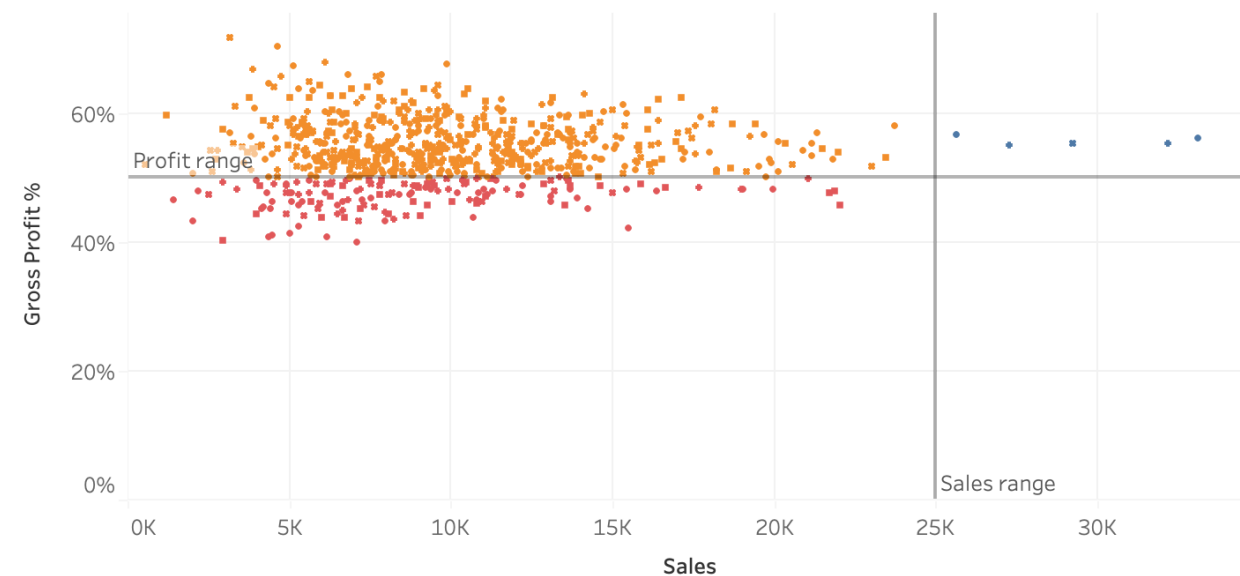
Survival analysis



Chapter 3

- Table Calculations foundations
- Running and window functions
- Dynamic parameters

Quadrant chart



Chapter 4

- Date and time functions
- Time series analysis calculations
- Advanced financial calculations e.g., CAGR

Indexed growth



Thank you!
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