Forecasting in Power BI

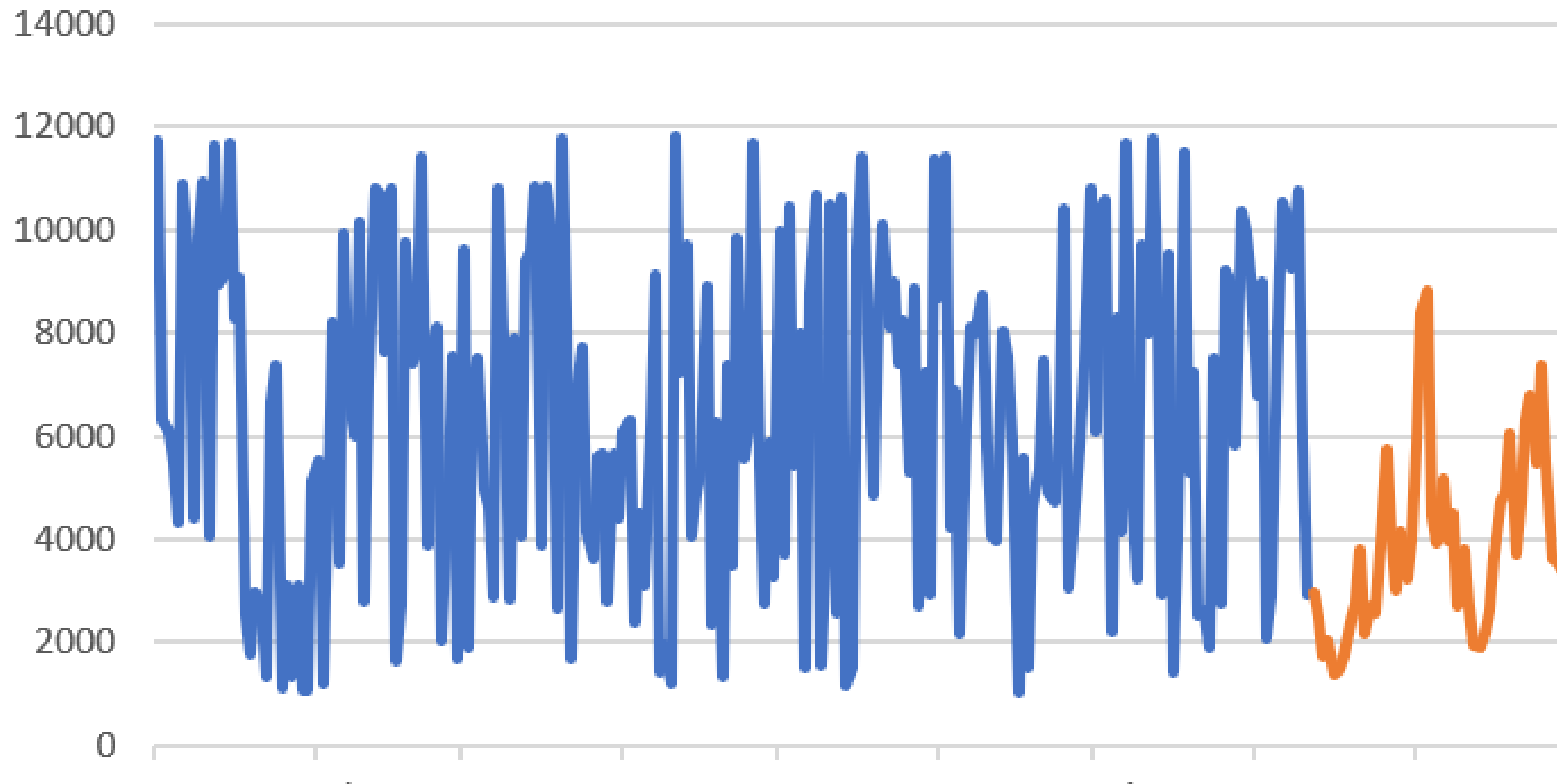## TIME SERIES ANALYSIS IN POWER BI

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Context and importance

Prediction is a more sophisticated analytic technique, allowing us to try and gain knowledge about what *will happen*, not just what has happened.

Forecasting types

Forecasting

- Takes existing data and projects into future dates

- A kind of *predictive* or *prescriptive* analytics

Industry Examples

1. Forecasting demand for a particular product

2. Predicting the headcount needed to support your engineering department

Hindcasting

- Take your forecast and "predicts" your existing data

- Typically used to test the accuracy of forecast model

Industry Examples

1. Hindcasting climate conditions that led to particular environmental changes

2. Seeing if the stock forecast model is accurate

Forecasting fundamentals

Forecasting takes historical data and attempts to predict values for future dates.

Take a look at the following table:

| date	value
January 1	5
January 2	10
January 3	15
January 4	
January 5	

By using the overall trend of our data, we can relatively reliably predict what we think the next values should be. This is an example of a *linear regression*.

date	value
January 1	5
January 2	10
January 3	15
January 4	**20**
January 5	**25**

Forecasting messy data

Time series data is often messy and can be problematic to forecast unless "cleaned" up.

Exponential Smoothing is a technique to "smooth out" the noise in data.

Noisy Data
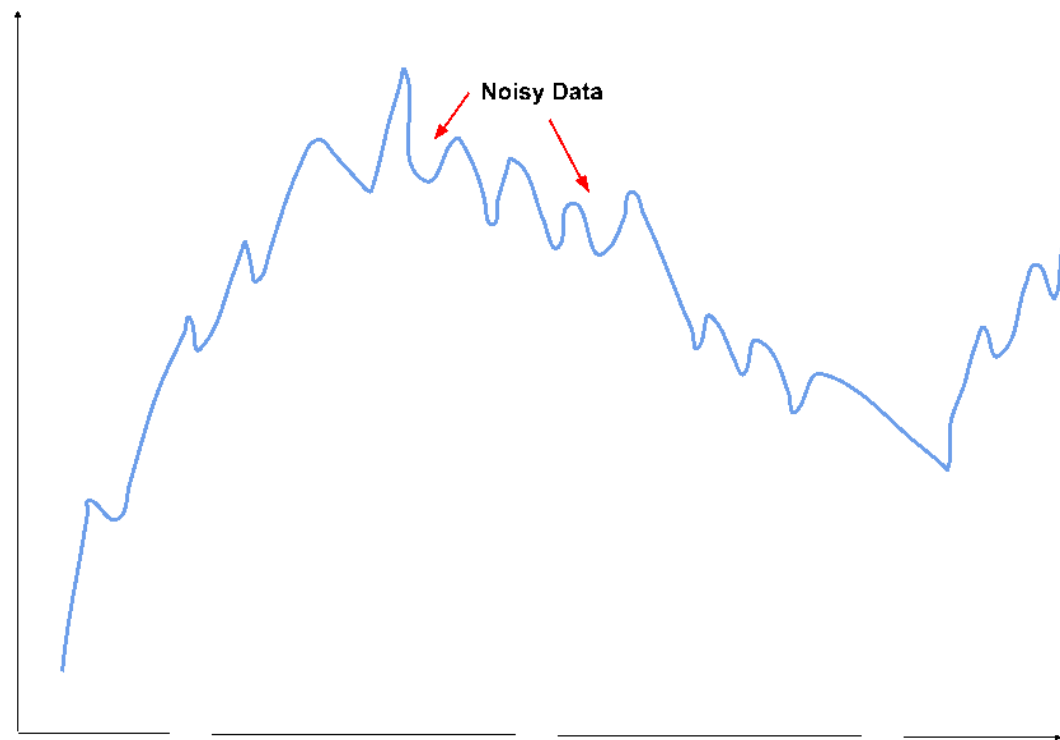
Confidence in forecasts

With any forecast, there is going to be an error because we don't have actual data for those dates!

Confidence Intervals - provide a range of estimates that the data will fall into with an assumed level of confidence (%)

> Power BI allows you to configure how much confidence you want in forecasts.`

95%
Confidence

Forecasted
Data

Historical
Data
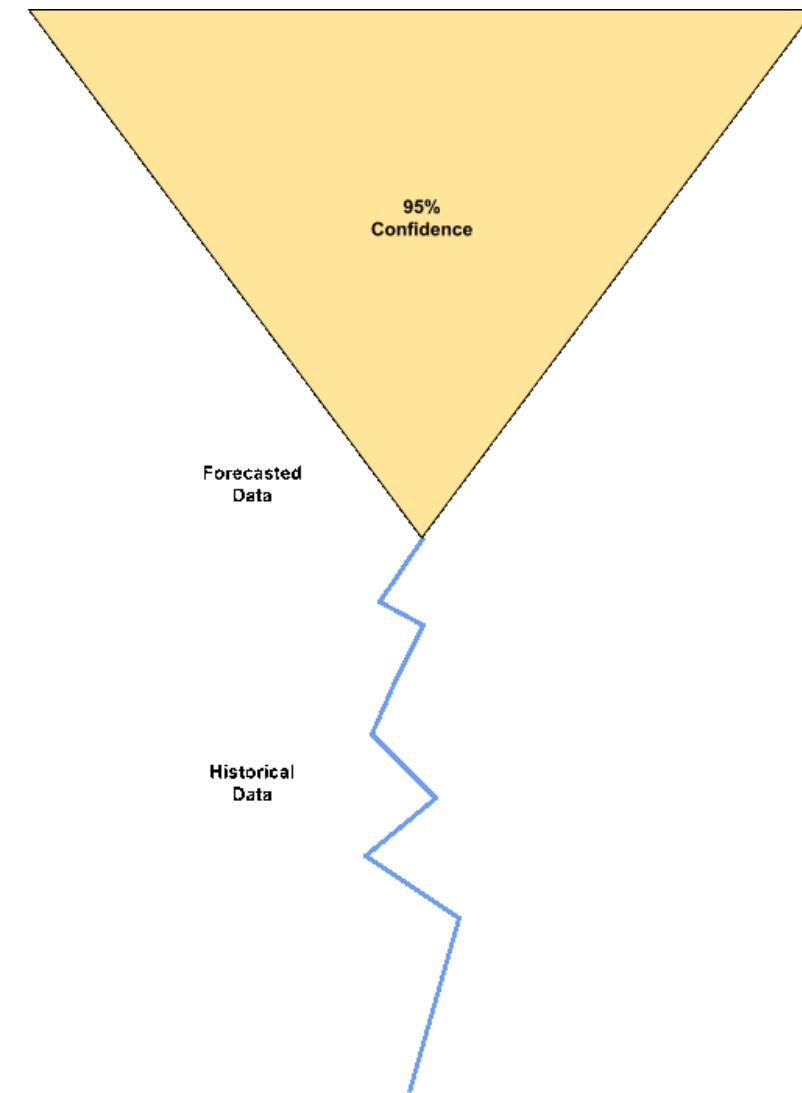
Stock dataset

We will practice forecasting on some stock data for Microsoft (ticker: MSFT). The data includes basic information on the stock's trading price on a given day.

date	ticker	open	high	low	close	volume
Monday, January 1, 2018	MSFT	86.13	86.31	85.5	85.95	22483797
Tuesday, January 2, 2018	MSFT	86.13	86.31	85.5	85.95	22483797
Wednesday, January 3, 2018	MSFT	86.13	86.31	85.5	85.95	22483797
Thursday, January 4, 2018	MSFT	86.06	86.51	85.97	86.35	26061439
Friday, January 5, 2018	MSFT	86.59	87.66	86.57	87.11	21911974
Saturday, January 6, 2018	MSFT	87.66	88.41	87.43	88.19	23407110
Sunday, January 7, 2018	MSFT	87.66	88.41	87.43	88.19	23407110
Monday, January 8, 2018	MSFT	87.66	88.41	87.43	88.19	23407110
Tuesday, January 9, 2018	MSFT	88.2	88.58	87.6	88.28	22113049
Wednesday, January 10, 2018	MSFT	88.65	88.73	87.86	88.22	19484317

Let's practice!

TIME SERIES ANALYSIS IN POWER BI

Forecasting types of energy consumption

TIME SERIES ANALYSIS IN POWER BI

Kevin Barlow

Data Analytics Professional

Let's practice!

TIME SERIES ANALYSIS IN POWER BI

Forecasting in Power BI: DAX

TIME SERIES ANALYSIS IN POWER BI
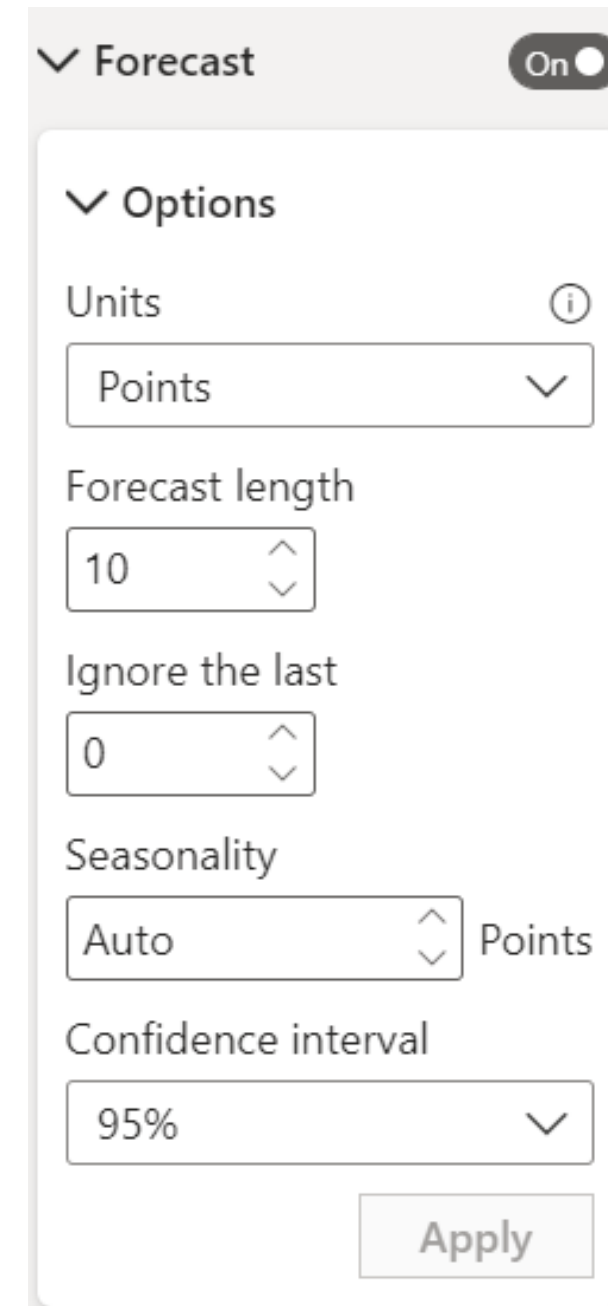
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Context and importance

Built-in capabilities are a great start but are limited.

Tuning and optimization aren't really an option and are restricted to base parameters.

Other alternatives
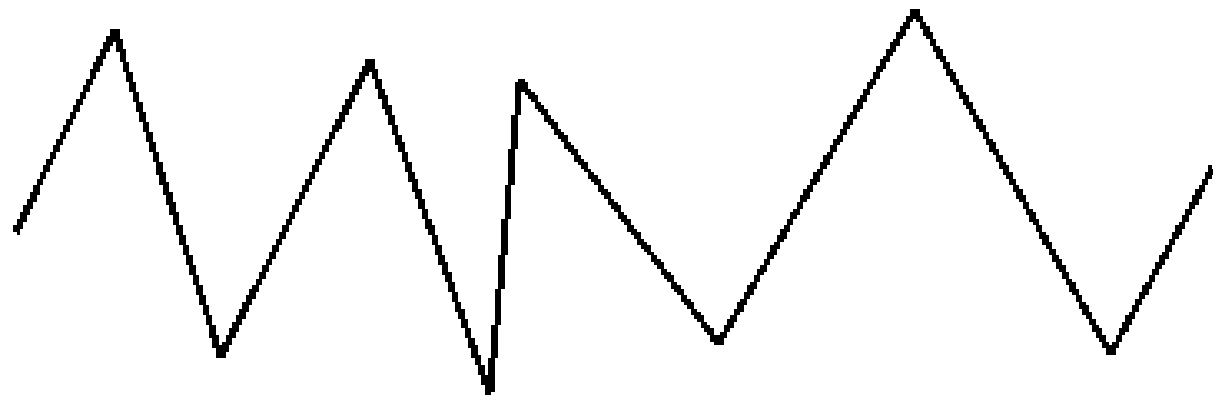
- Programming Languages (Python / R)

- Excel

- DAX

DAX forecasting basic principles

With DAX, we can approximate the behavior of a dataset over our given timeframe.

1. Identify the last point of data.

2. Calculate the data trend (geometric mean).

3. Project into the future.

> *A geometric mean provides an average for an exponentially changing dataset.*

CAGR

Compound Annual Growth Rate (CAGR)

$$CAGR = \left(\frac{Last\ Value}{First\ Value} \right)^{\left(\frac{1}{n\ periods} \right)} - 1$$

While this formula is for annual growth, the same logic can be applied to other time intervals (e.g. monthly growth rate)

Using CAGR to forecast

Forecasting future values

$$Future\ Value\ =\ (LV)\ *\ (1\ +\ CAGR)^{n}$$

LV = Last Value

n = number of periods in the future

You could test this formula on your data by hindcasting!

Let's practice!

TIME SERIES ANALYSIS IN POWER BI

Forecasting types of energy consumption - DAX

TIME SERIES ANALYSIS IN POWER BI

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Let's practice!

TIME SERIES ANALYSIS IN POWER BI

Course wrap-up

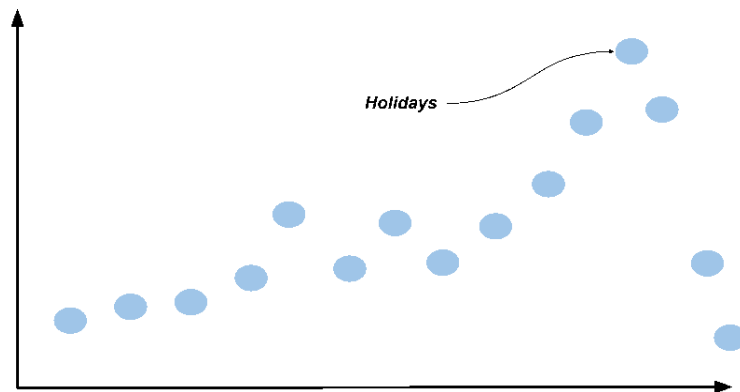## TIME SERIES ANALYSIS IN POWER BI

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Time series data fundamentals

Different kinds of data variation

1. Seasonal

2. Cyclical

3. Secular

4. Irregular

Manipulating time series data

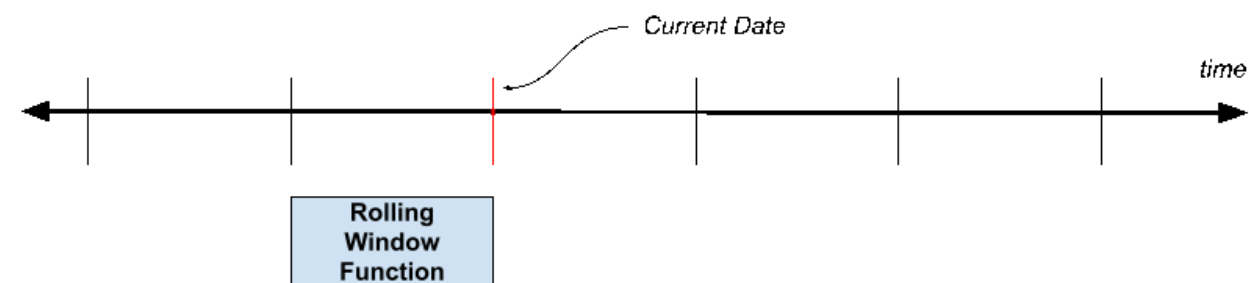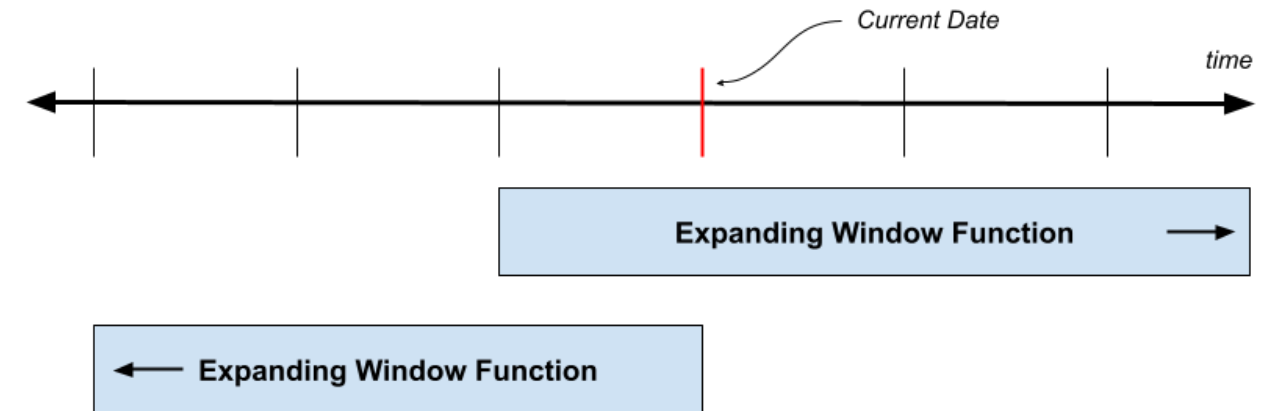Time series data formats:

1. ISO 8601 standards

2. UNIX

Power BI functions:

1. `DATEADD()`

2. `DATEDIFF()`

3. `FORMAT()`

Window functions

Expanding window functions

Analysis relative to a single anchor point in time
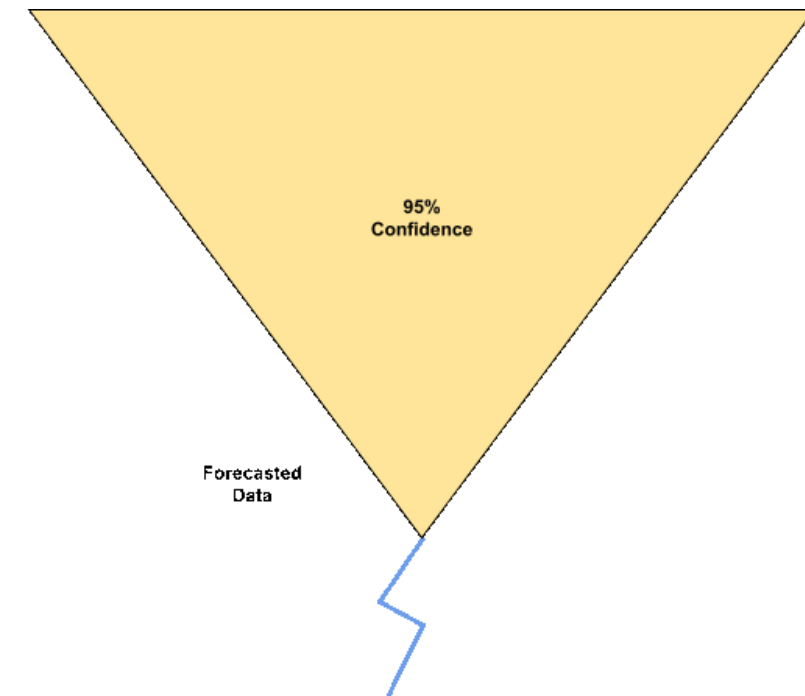

Rolling window functions

Consistent span of time, changes with new data

Forecasting time series

Forecasting and *hindcasting* take historical data and project into future dates with a given *confidence interval*.

95%
Confidence

Forecasted
Data

There are several techniques to forecast data, including using averages and geometric means.

Congratulations!

TIME SERIES ANALYSIS IN POWER BI