Time Series and Forecasting

Overview

Time Series - definition

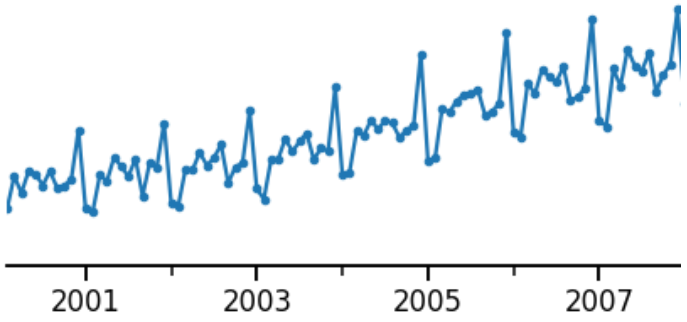
✓ Time series are data points **indexed in time order**.

✓ Time series data is a collection of observations obtained through repeated measurements over time.

Time Series

Time series have **values** and a **time index variable.**

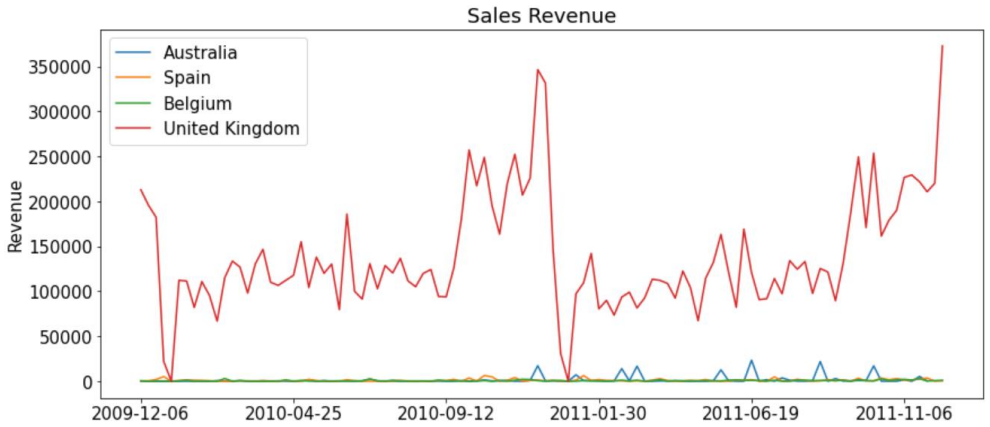
Time	Sales
30/03/20	200
31/03/20	220
01/04/20	230
02/04/20	235



- Sales, energy consumption, temperature, etc.

Multiple Time Series

	Sales			
Time	**UK**	**Spain**	**Australia**	**Belgium**
30/03/20	200	100	330	120
31/03/20	220	120	300	135
01/04/20	230	150	335	133
02/04/20	235	175	340	200



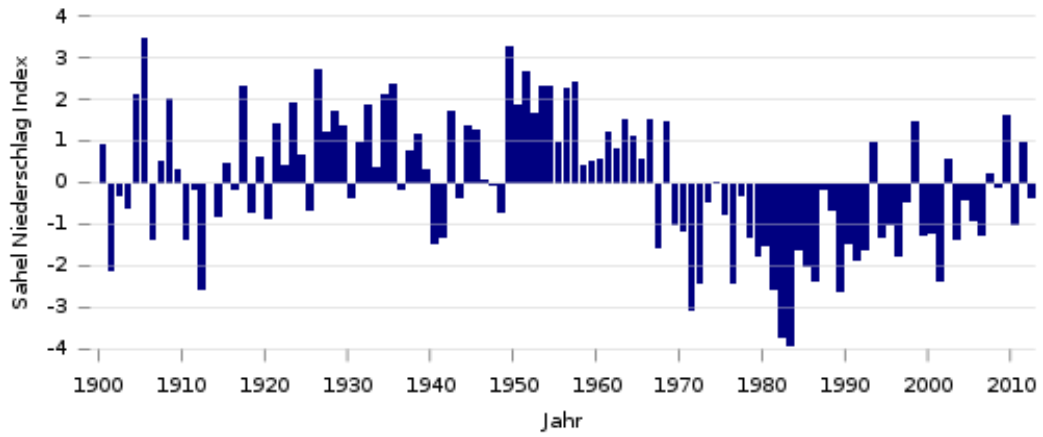
- Sales – multiple channels (some times also called entities)
- Energy consumption – multiple households

Time Series – examples

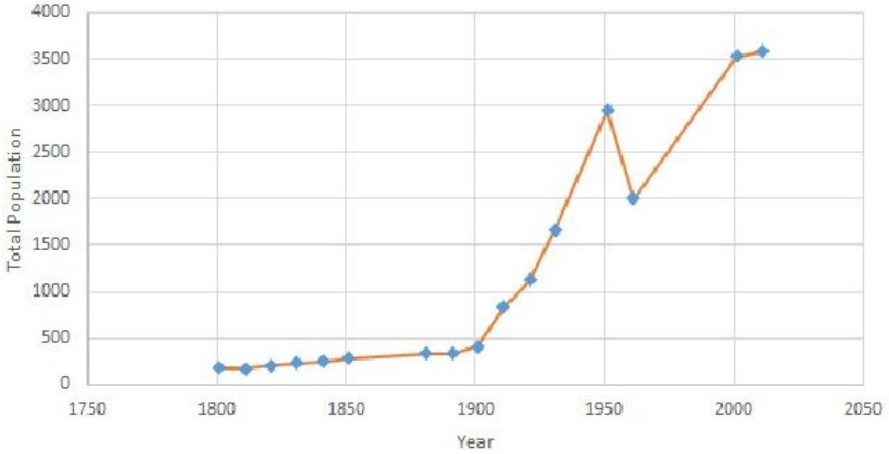
- Stock and share price
- Sales
- Donations
- Energy consumption & production
- Air quality, temperature, ocean tides
- Electrocardiograms, encephalograms

Time Series – examples

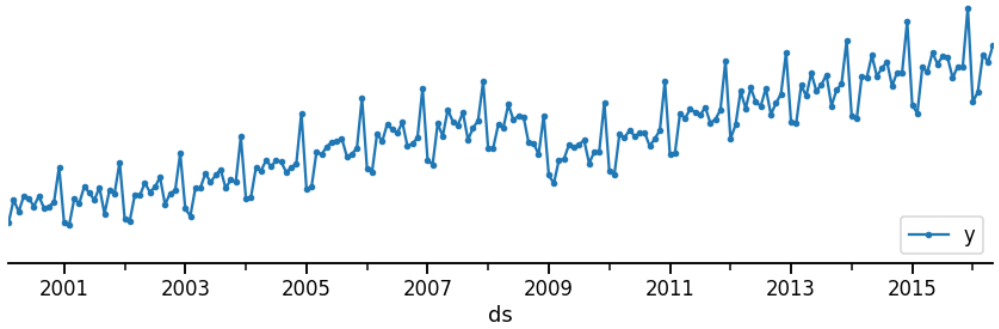
Rainfall



Population growth



Retail sales

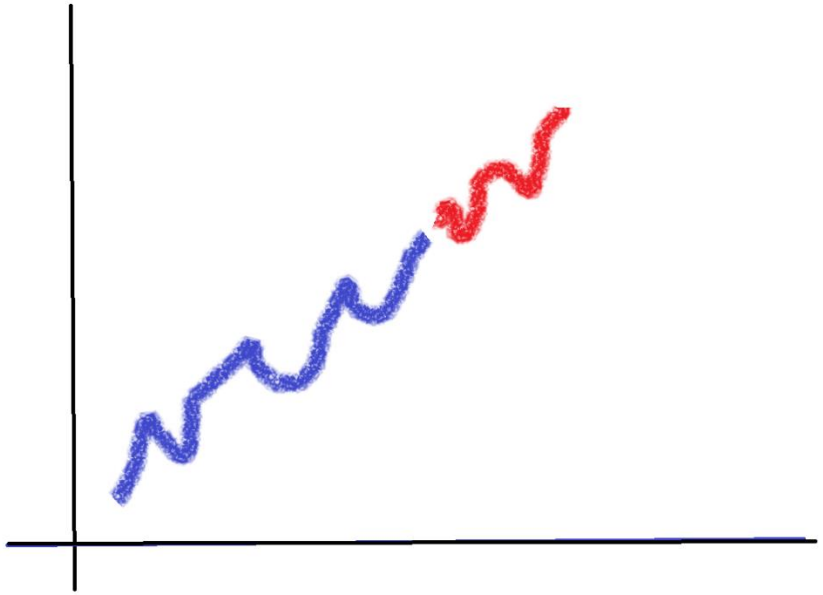


Electrocardiogram

Forecasting - definition

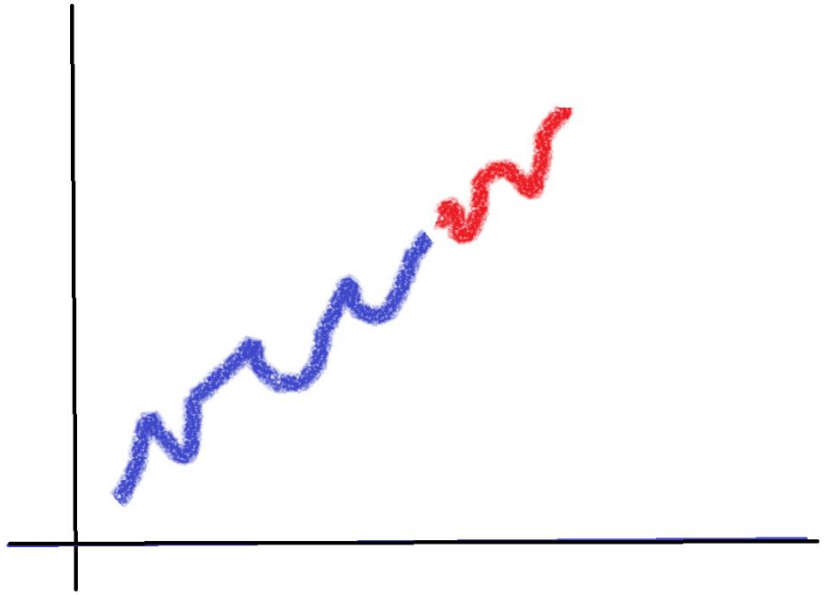
Forecasting: predicting future values of the time series through values and events in the past and present.

Predict future values



Forecasting - examples

Predict future values



- Sales forecasting
- Product demand forecasting
- Income through donations
- Energy demand and production
- Stock price forecasting

Forecasting - challenges

Supervised Learning

We know the value of predictor variables

We assume that future data looks like past data

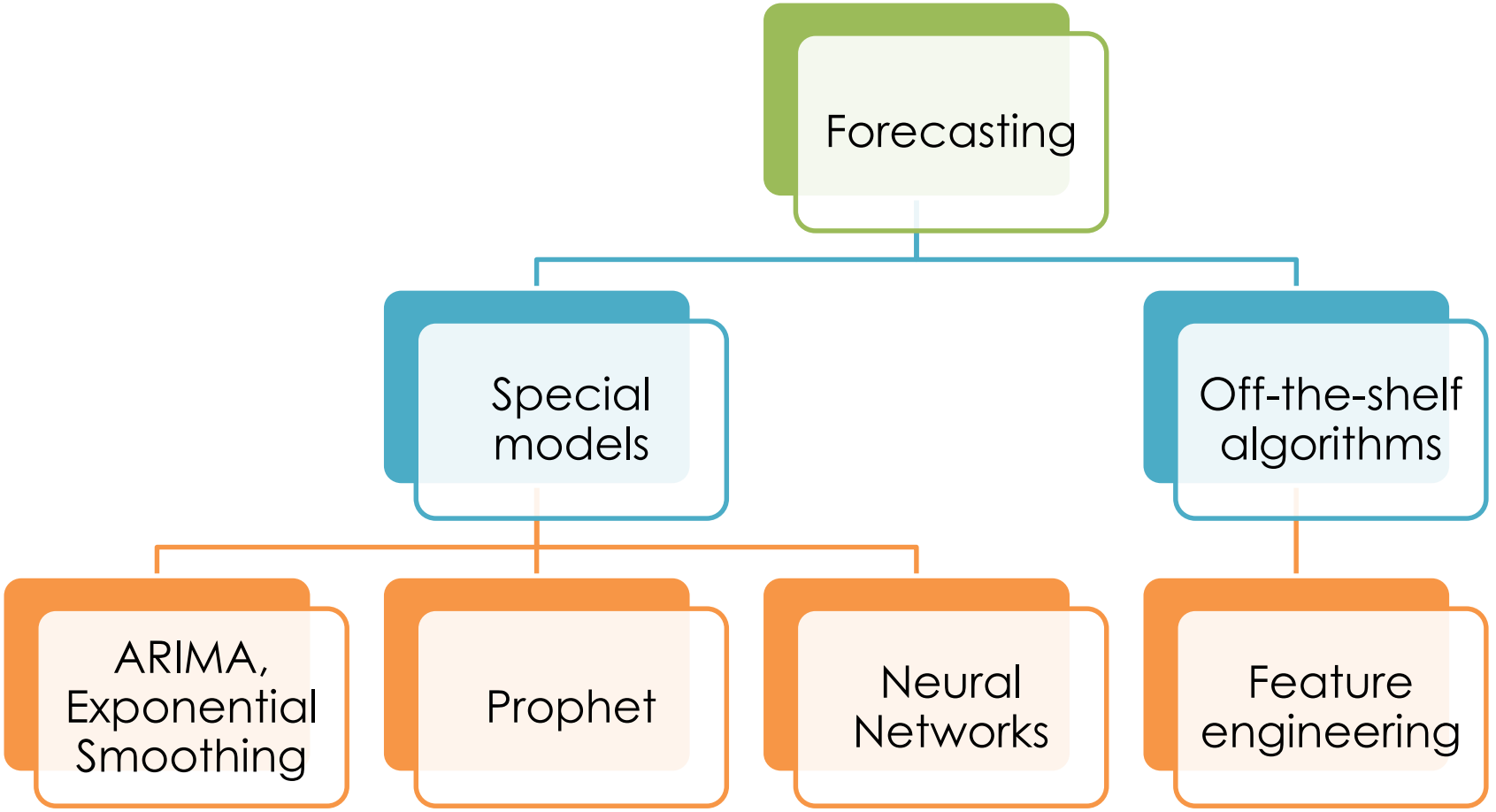
Forecasting

Often don't know the value of the predictors

Sometimes don't even have predictors

Time series are dynamic: distributions change respect to training data

Forecasting - challenges



Summary

Time series are data points indexed in time order.

Forecasting is predicting future values based on past data.

Forecasting can be done with special models and traditional machine learning + feature engineering.