Aston Business School

‘Naïve’ methods of Forecasting

BN2255 – Business Analytics in Practice

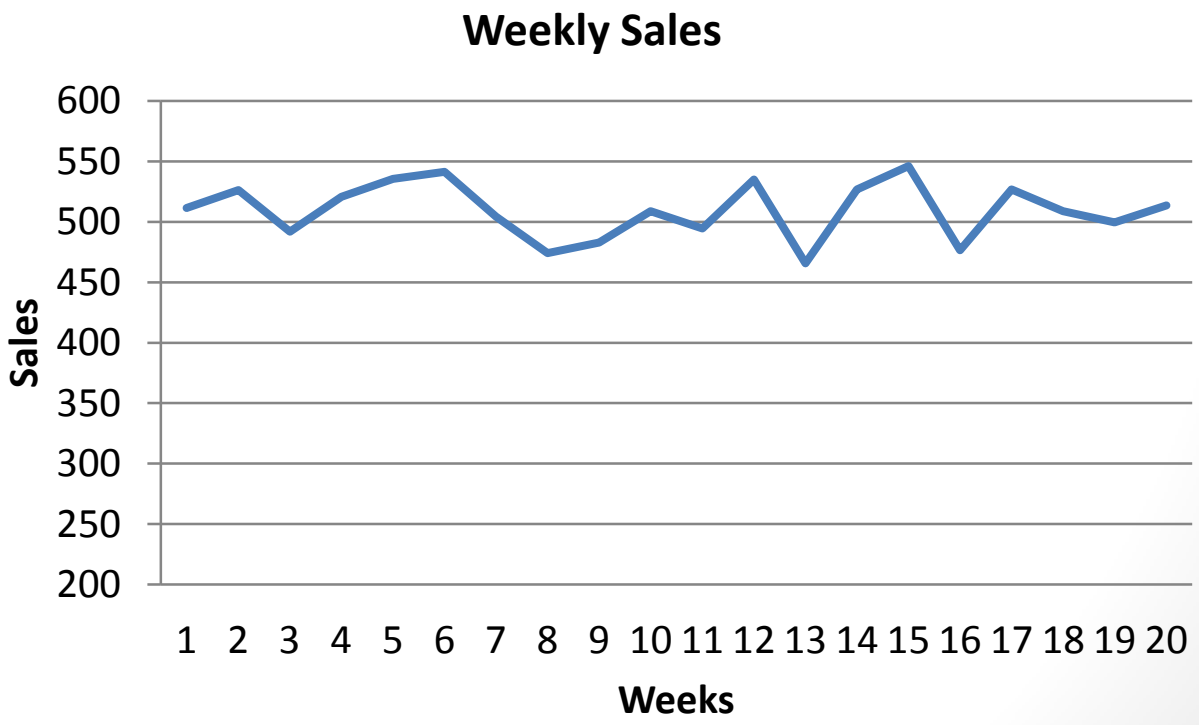
Trend analysis

- In forecasting the main goal is to find a trend in the data
  - a trend is a regular underlying pattern in the data
- Finding this trend allows us to use the past to predict the future
- Three main methods of finding a trend in a data series
  - Moving average methods, also called ‘naïve’
  - Time-series analysis
  - Causal models

Cornershop plc

- Cornershop plc wants to create a model that will help it forecast its sales. It has provided you with the following data on sales over the last 20 weeks.

Week	Sales
1	512
2	526
3	492
4	521
5	535
6	541
7	504
8	474
9	483
10	509
11	494
12	535
13	466
14	527
15	546
16	476
17	527
18	509
19	500
20	514



Moving averages

- Always a good idea to plot your data!
  - Here plot suggests that past sales show relatively small variation
    - AVERAGE = 509 , STDEV = 23.4, CoV = 4.6%
- How to predict the future?
  - Assume that it will be much like the past
  - Since the past is relatively stable, we can calculate its central tendency
  - In this case, the central tendency is adequately described by the AVERAGE!
    - Remember, the AVERAGE is often our 'best guess'
- Should we use the average of the whole series, or just a subset?
  - What is more likely: the (near) future depends on the recent past or can be equally influenced by the distant past?
    - Is the near past a better predictor of the future relatively to more distant periods?
    - If so, we then we want to only consider the more recent past in out forecasts

- Moving average forecasts: use the average of the data series from the last **n** periods as the forecast for the next period

Forecasting errors

- How to decide on an appropriate number for **n**?
  - Use the one that produces the smallest forecasting errors
- We measure forecasting errors using *backcasting*
  - *Create a forecast for a period where we know the realised value and compare the forecast with the realised*
- Measures
  - Mean Absolute Deviation (MAD)
    - Absolute Deviation = ABS(forecast – realised)
  - Mean Square Error (MSE)
    - Square error = (forecast – realised)^2

Method for choosing **n**

1) Create forecasts (backcasts) for different values of n and calculate their errors
2) Choose the value of n such that it results in smaller MAD and MSE values

Pros and Cons of Moving averages

- Pros:
  - Simple to use
  - Quick to estimate
  - Easy to explain
  - Low cost
  - Reasonably accurate (when series is stationary)

- Cons
  - Simplistic
  - Not suitable for long-term forecasts
  - Unsuitable if series is non-stationary

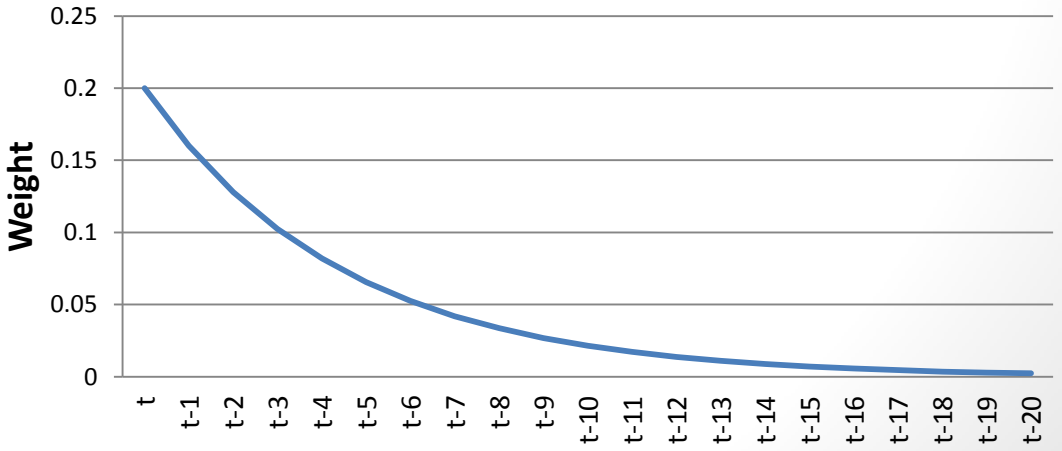
Exponential smoothing

- When using a MA forecast, is it logical for each period to have an equal weight in the outcome of the forecast?
  - Often, we want to place more weight at more recent periods, because we believe that the recent past better reflects the current situation
- An easy way to impose this is to adopt an exponential weighting pattern to our moving average

$$F_{t+1} = aD_t + a(1-a)\,D_{t-1} + a(1-a)^2\,D_{t-2} + a(1-a)^3\,D_{t-3} + \ldots + a(1-a)^{n-1}\,D_{t-(n-1)}$$

where,
F = forecast
D = realised values
t = time
n = number of observations

For a = 0.2



Exponential smoothing (2)

- Using simple mathematics, we can simplify the smoothing formula to:

$$F_{t+1} = aD_t + (1-a)\,F_t$$
or,
$$F_{t+1} = F_t + a(D_t - F_t)$$

- So: New forecast = Old forecast + a*(last forecast error)
- The choice of the alpha value (a) is significant
  - The greater the alpha, the more responsive the model is to past errors
    - Good in situations of rapid change, bad when the error was simply the result of randomness
  - **Usually, we adopt values of a in the range of 0.15 to 0.35**
- How to choose between different potential values of alpha?
  - Use the one that results in smaller forecasting errors!