

Data Science for Supply Chain

Moving Average

The average demand during the last n periods.

$$f_n = \frac{1}{n} \sum_{i=1}^n d_{t-i}$$

Where:

- n is the number of periods we take the average of
- d_t the demand we observe during period t
- f_t is the forecast we made for period t

The first forecast will be done for $t = n + 1$

In scientific literature, you will find often see the output you want to predict noted y

A prediction would be noted as \hat{y}

When we want to point to a specific occurrence of the forecast at time t , we will not it f_t or d_t

Demand observation: we will call the demand of each period.

Noise: an unexplained variation in the data. It is often due to the randomness of the different processes at hand.

References

- Moving Average:

```
library(tidyverse)
```

```
## Warning: package 'tidyverse' was built under R version 3.5.3
## -- Attaching packages ----- tidyverse 1.3.0 --
## v ggplot2 3.3.2      v purrr   0.3.4
## v tibble  3.0.1      v dplyr   0.8.5
## v tidyr   1.0.0      v stringr 1.4.0
## v readr   1.3.1      v forcats 0.5.0
## Warning: package 'tibble' was built under R version 3.5.3
## Warning: package 'tidyr' was built under R version 3.5.3
## Warning: package 'readr' was built under R version 3.5.2
## Warning: package 'purrr' was built under R version 3.5.3
## Warning: package 'dplyr' was built under R version 3.5.3
## Warning: package 'stringr' was built under R version 3.5.3
## Warning: package 'forcats' was built under R version 3.5.3
```

```

## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag() masks stats::lag()
library(lubridate)

##
## Attaching package: 'lubridate'
## The following object is masked from 'package:base':
##
## date
library(fpp2)

## -- Attaching packages ----- fpp2 2.4 --
## v forecast 8.7 v expsmooth 2.3
## v fma 2.4
## Warning: package 'forecast' was built under R version 3.5.3
## Warning: package 'fma' was built under R version 3.5.3
## Warning: package 'expsmooth' was built under R version 3.5.3
##
library(zoo)

## Warning: package 'zoo' was built under R version 3.5.3
##
## Attaching package: 'zoo'
## The following objects are masked from 'package:base':
##
## as.Date, as.Date.numeric
dmd <- tibble::tribble(
  ~Date, ~Demand,
  "2010-1-1", 37,
  "2011-1-1", 60,
  "2012-1-1", 85,
  "2013-1-1", 112,
  "2014-1-1", 132,
  "2015-1-1", 145,
  "2016-1-1", 179,
  "2017-1-1", 198,
  "2018-1-1", 212,
  "2019-1-1", 232,
  "2020-1-1", NA,
  "2021-1-1", NA,
  "2022-1-1", NA
)

dmd$Date <- as.Date(dmd$Date)

demand <- dmd %>% mutate(srate_ma_1 = rollmean(Demand, k = 4, fill = NA, align = "right"),

```

```
srate_ma_2 = rollmean(Demand, k = 5, fill = NA, align = "right"),
srate_ma_3 = rollmean(Demand, k = 6, fill = NA, align = "right"))
```

demand

```
## # A tibble: 13 x 5
```

	Date	Demand	srate_ma_1	srate_ma_2	srate_ma_3
	<date>	<dbl>	<dbl>	<dbl>	<dbl>
## 1	2010-01-01	37	NA	NA	NA
## 2	2011-01-01	60	NA	NA	NA
## 3	2012-01-01	85	NA	NA	NA
## 4	2013-01-01	112	73.5	NA	NA
## 5	2014-01-01	132	97.2	85.2	NA
## 6	2015-01-01	145	118.	107.	95.2
## 7	2016-01-01	179	142	131.	119.
## 8	2017-01-01	198	164.	153.	142.
## 9	2018-01-01	212	184.	173.	163
## 10	2019-01-01	232	205.	193.	183
## 11	2020-01-01	NA	NA	NA	NA
## 12	2021-01-01	NA	NA	NA	NA
## 13	2022-01-01	NA	NA	NA	NA

```
demand %>% gather(metric, value, Demand:srate_ma_3) %>%
  ggplot(aes(Date, value, color = metric)) +
  geom_line()
```

```
## Warning: Removed 24 row(s) containing missing values (geom_path).
```

