

# Some Simple Forecasting Methods

Let's look at some very simple methods for forecasting this important variable. Although simple, they could be rather effective in practice.

1. Average method
2. Naive method
3. Seasonal naive method
4. Drift method

# Some simple forecasting methods

## Average method

- ▶ Forecast of all future values is equal to mean of historical data  $\{y_1, \dots, y_T\}$ .
- ▶ Forecasts:  $\hat{y}_{T+h|T} = \bar{y} = (y_1 + \dots + y_T)/T$

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## Naïve method

- ▶ Forecasts equal to last observed value.
- ▶ Forecasts:  $\hat{y}_{T+h|T} = y_T$ .
- ▶ Consequence of efficient market hypothesis.

These two approaches are extreme cases, and there are two equivalent to think of them.

1. We can think of the average method as using all the data point, but the naive method uses only one data point. A less extreme way may be to use some data points (perhaps a subset?).

2. We can also rewrite the average method and the naive method as follows

$$\hat{y}_{T+h|T} = \frac{1}{T} \times y_1 + \frac{1}{T} \times y_2 + \cdots + \frac{1}{T} \times y_T$$

$$\hat{y}_{T+h|T} = 0 \times y_1 + 0 \times y_2 + \cdots + 1 \times y_T$$

2. We can also rewrite the average method and the naive method as follows

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$$\hat{y}_{T+h|T} = 0 \times y_1 + 0 \times y_2 + \cdots + 1 \times y_T$$

Perhaps a different weighting scheme?

## Seasonal naïve method

- ▶ Forecasts equal to last value from same season.
- ▶ Forecasts:  $\hat{y}_{T+h|T} = y_{T+h-m(k+1)}$ , where  $m$  = seasonal period and  $k$  is the integer part of  $(h-1)/m$ .

**How do we take into account trend?**

Hint: You can think of an average method and a naive method, too!



## Drift method (taking into some trend, if any)

- ▶ Forecasts equal to last value plus average change.
- ▶ Forecasts:

$$\begin{aligned}\hat{y}_{T+h|T} &= y_T + \frac{h}{T-1} \sum_{t=2}^T (y_t - y_{t-1}) \\ &= y_T + \frac{h}{T-1} (y_T - y_1).\end{aligned}$$

- ▶ Equivalent to extrapolating a line drawn between first and last observations.

Naive trend method may be

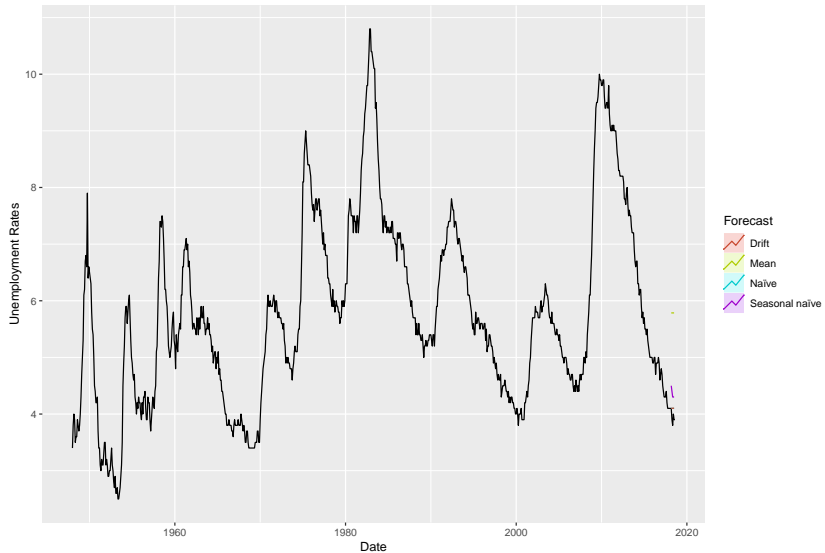
$$\hat{y}_{T+h|T} = y_T + h(y_T - y_{T-1})$$

## Some simple forecasting methods in R

- ▶ Mean: `meanf(y, h=20)`
- ▶ Naïve: `naive(y, h=20)`
- ▶ Seasonal naïve: `snaive(y, h=20)`
- ▶ Drift: `rwf(y, drift=TRUE, h=20)`

```
## [1] "UNRATE"
```

Forecasts for monthly unemployment rates with Data from Jan 1948 to Feb 2018



Forecasts for monthly unemployment rates with Data from Jan 2010 to Feb 2018

