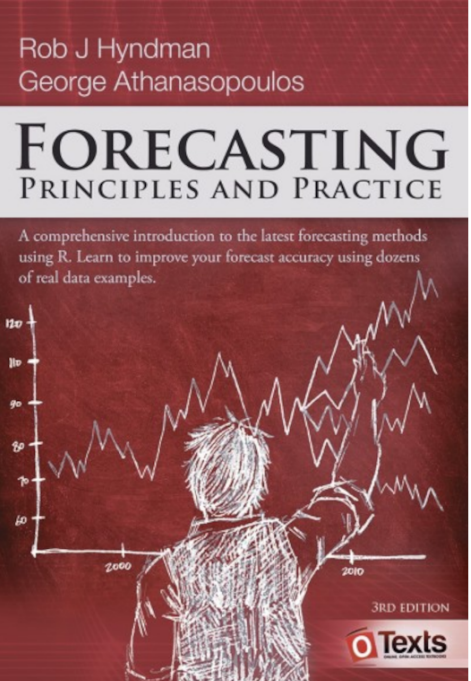


5. The forecaster's toolbox

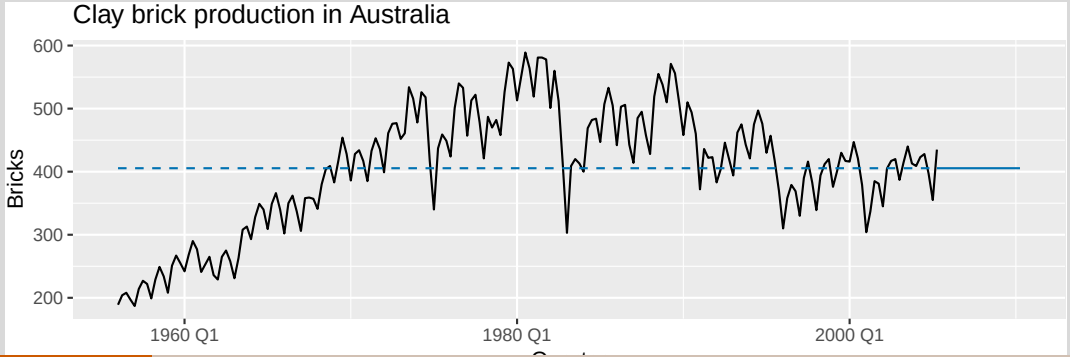
5.2 Some simple forecasting methods

OTexts.org/fpp3/

Some simple forecasting methods

`MEAN(y)`: Average method

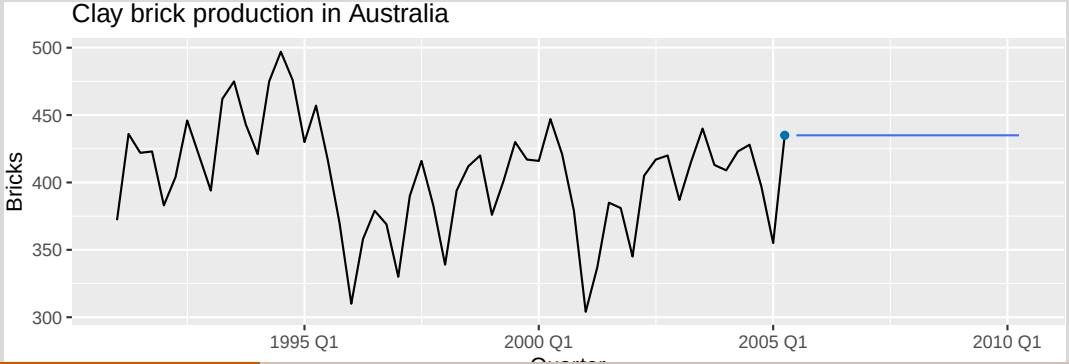
- Forecast of all future values is equal to mean of historical data $\{y_1, \ldots, y_T\}$.
- Forecasts: $\hat{y}_{T+h|T} = \bar{y} = (y_1 + \cdots + y_T)/T$



Some simple forecasting methods

`NAIVE(y)`: Naïve method

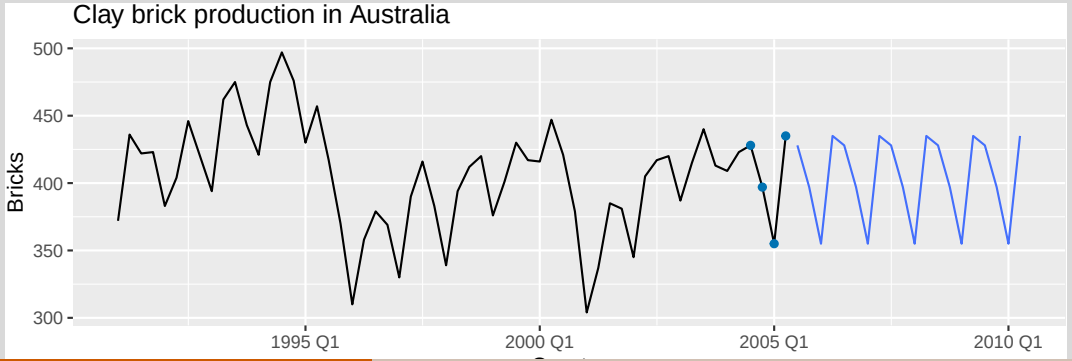
- Forecasts equal to last observed value.
- Forecasts: $\hat{y}_{T+h|T} = y_T$.
- Consequence of efficient market hypothesis.



Some simple forecasting methods

`SNAIVE(y ~ lag(m))`: 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 $(h-1)/m$.



Some simple forecasting methods

`RW(y ~ drift())`: Drift method

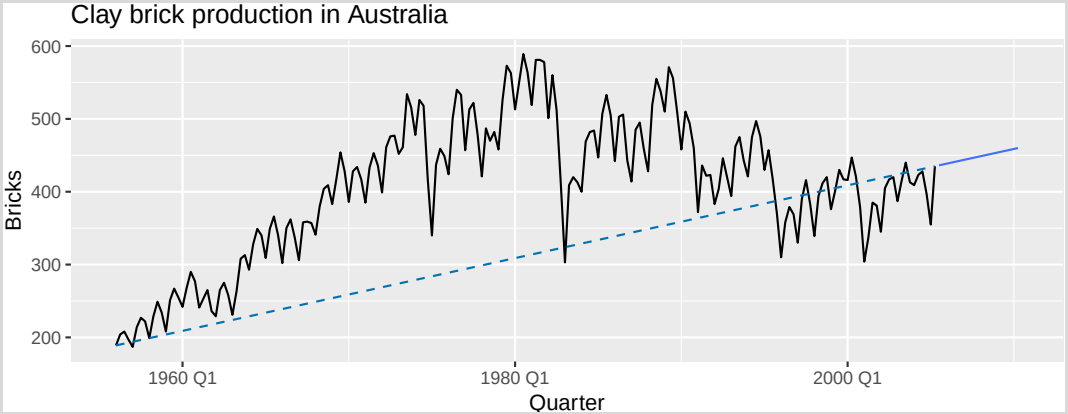
- Forecasts equal to last value plus average change.
- Forecasts:

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

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

Some simple forecasting methods

Drift method



Model fitting

The `model()` function trains models to data.

```
brick_fit <- aus_production |>
  filter(!is.na(Bricks)) |>
  model(
    Seasonal_naive = SNAIVE(Bricks),
    Naive = NAIVE(Bricks),
    Drift = RW(Bricks ~ drift()),
    Mean = MEAN(Bricks)
  )
```

```
## # A mable: 1 x 4
##   Seasonal_naive   Naive          Drift    Mean
##           <model> <model>        <model> <model>
## 1       <SNAIVE> <NAIVE> <RW w/ drift>  <MEAN>
```

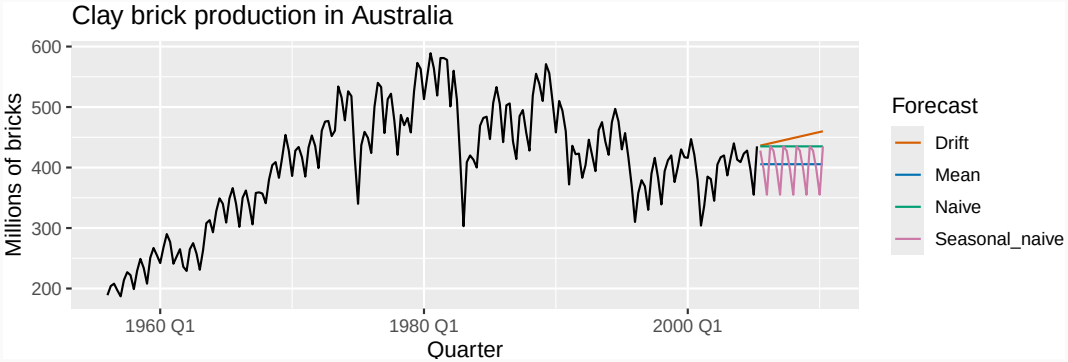
Producing forecasts

```
brick_fc <- brick_fit |>
  forecast(h = "5 years")
```

```
## # A fable: 80 x 4 [1Q]
## # Key:     .model [4]
##   .model          Quarter       Bricks .mean
##   <chr>             <qtr>       <dist> <dbl>
## 1 Seasonal_naive 2005 Q3 N(428, 2336)   428
## 2 Seasonal_naive 2005 Q4 N(397, 2336)   397
## 3 Seasonal_naive 2006 Q1 N(355, 2336)   355
## 4 Seasonal_naive 2006 Q2 N(435, 2336)   435
## # i 76 more rows
```

Visualising forecasts

```
brick_fc |>
  autoplot(aus_production, level = NULL) +
  labs(title = "Clay brick production in Australia",
       y = "Millions of bricks") +
  guides(colour = guide_legend(title = "Forecast"))
```



Facebook closing stock price

```
# Extract training data
fb_stock <- gafa_stock |>
  filter(Symbol == "FB") |>
  mutate(trading_day = row_number()) |>
  update_tsibble(index = trading_day, regular = TRUE)

# Specify, estimate and forecast
fb_stock |>
  model(
    Mean = MEAN(Close),
    Naive = NAIVE(Close),
    Drift = RW(Close ~ drift())
  ) |>
  forecast(h = 42) |>
  autoplot(fb_stock, level = NULL) +
  labs(title = "Facebook closing stock price", y = "$US") +
  guides(colour = guide_legend(title = "Forecast"))
```

Facebook closing stock price