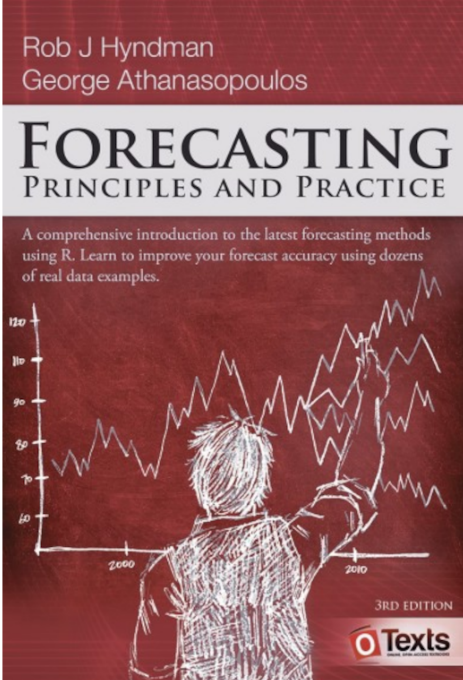
5. The forecaster's toolbox

5.7 Forecasting with decomposition

OTexts.org/fpp3/



Forecasting and decomposition

$$y_t = \hat{S}_t + \hat{A}_t$$

- $\hat{A}_t$ is seasonally adjusted component
- $\hat{S}_t$ is seasonal component.

- Forecast $\hat{S}_t$ using SNAIVE.
- Forecast $\hat{A}_t$ using non-seasonal time series method.
- Combine forecasts of $\hat{S}_t$ and $\hat{A}_t$ to get forecasts of original data.

US Retail Employment

```r
us_retail_employment <- us_employment |>
  filter(year(Month) >= 1990, Title == "Retail Trade") |>
  select(-Series_ID)
us_retail_employment
```

```
## # A tsibble: 357 x 3 [1M]
##        Month Title        Employed
##        <mth> <chr>           <dbl>
##  1 1990 Jan Retail Trade   13256.
##  2 1990 Feb Retail Trade   12966.
##  3 1990 Mar Retail Trade   12938.
##  4 1990 Apr Retail Trade   13012.
##  5 1990 May Retail Trade   13108.
##  6 1990 Jun Retail Trade   13183.
##  7 1990 Jul Retail Trade   13170.
##  8 1990 Aug Retail Trade   13160.
##  9 1990 Sep Retail Trade   13113.
```

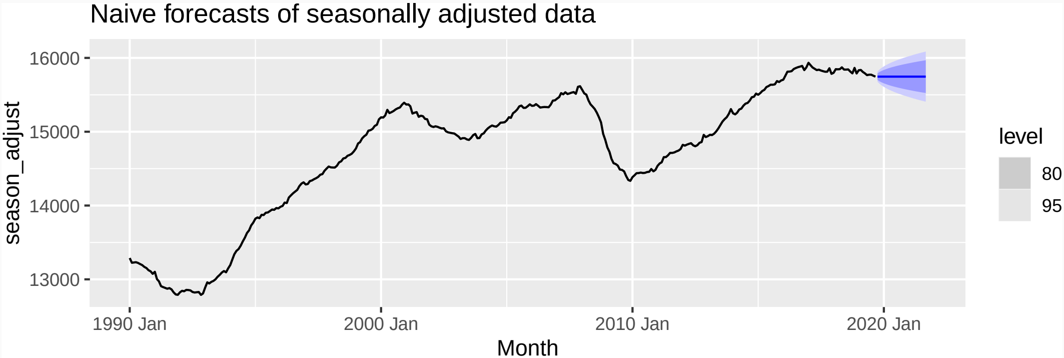
US Retail Employment

```r
dcmp <- us_retail_employment |>
  model(STL(Employed)) |>
  components() |>
  select(-.model)
dcmp
```

```
## # A tsibble: 357 x 6 [1M]
##       Month Employed  trend season_year remainder season_adjust
##       <mth>    <dbl>  <dbl>       <dbl>     <dbl>         <dbl>
##  1 1990 Jan   13256. 13288.      -33.0      0.836        13289.
##  2 1990 Feb   12966. 13269.     -258.     -44.6          13224.
##  3 1990 Mar   12938. 13250.     -290.     -22.1          13228.
##  4 1990 Apr   13012. 13231.     -220.       1.05         13232.
##  5 1990 May   13108. 13211.     -114.      11.3          13223.
##  6 1990 Jun   13183. 13192.      -24.3     15.5          13207.
##  7 1990 Jul   13170. 13172.      -23.2     21.6          13193.
##  8 1990 Aug   13160. 13151.       -9.52    17.8          13169.
```

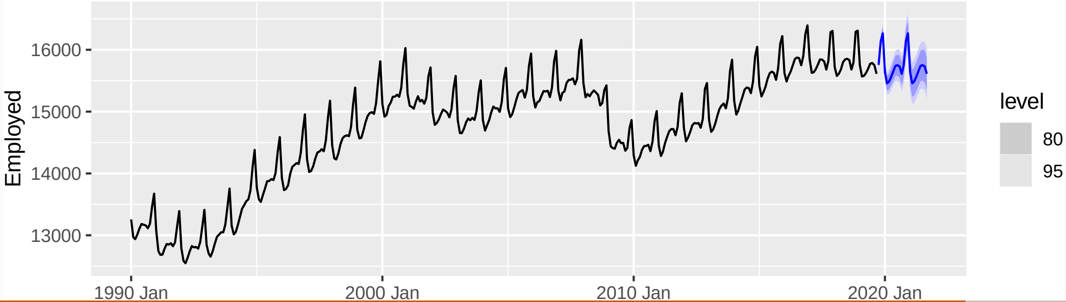
US Retail Employment

```r
dcmp |>
  model(NAIVE(season_adjust)) |>
  forecast() |>
  autoplot(dcmp) +
  labs(title = "Naive forecasts of seasonally adjusted data")
```



US Retail Employment

```
us_retail_employment |>
  model(stlf = decomposition_model(
    STL(Employed ~ trend(window = 7), robust = TRUE),
    NAIVE(season_adjust)
  )) |>
  forecast() |>
  autoplot(us_retail_employment)
```



Decomposition models

`decomposition_model()` creates a decomposition model

- You must provide a method for forecasting the `season_adjust` series.
- A seasonal naive method is used by default for the `seasonal` components.
- The variances from both the seasonally adjusted and seasonal forecasts are combined.