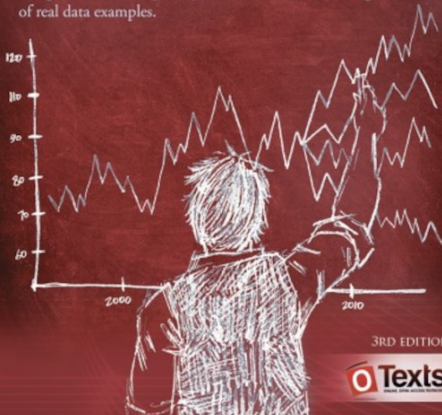Rob J Hyndman
George Athanasopoulos

# FORECASTING
## PRINCIPLES AND PRACTICE

A comprehensive introduction to the latest forecasting methods using R. Learn to improve your forecast accuracy using dozens of real data examples.

3RD EDITION

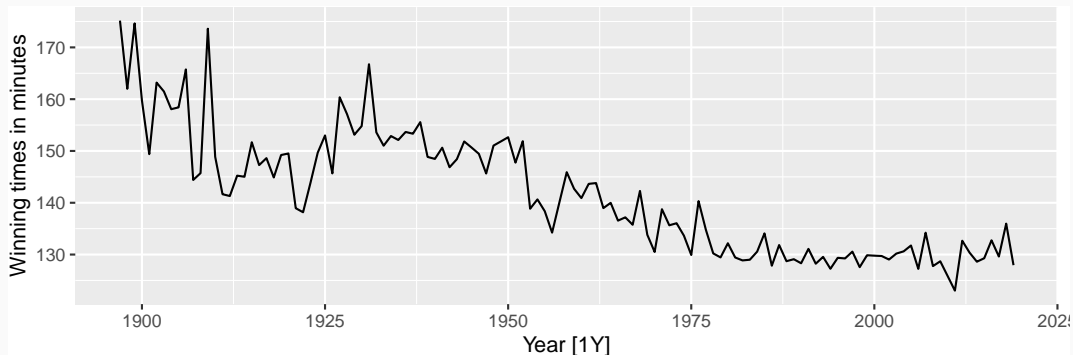OTexts

# 7. Time series regression models

7.7 Nonlinear regression

OTexts.org/fpp3/

# Example: Boston marathon winning times

```r
marathon <- boston_marathon |>
  filter(Event == "Men's open division") |>
  select(-Event) |>
  mutate(Minutes = as.numeric(Time) / 60)
marathon |> autoplot(Minutes) + labs(y = "Winning times in minutes")
```

# Example: Boston marathon winning times
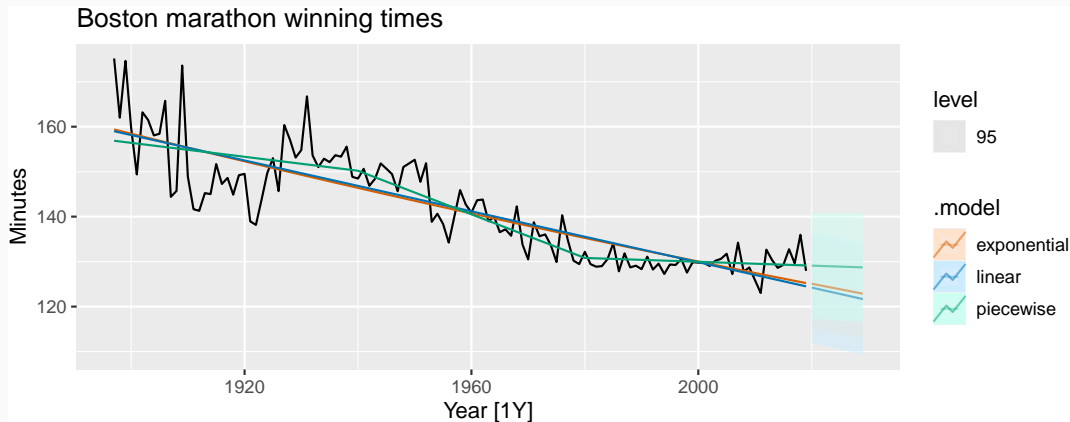
```r
fit_trends <- marathon |>
  model(
    # Linear trend
    linear = TSLM(Minutes ~ trend()),
    # Exponential trend
    exponential = TSLM(log(Minutes) ~ trend()),
    # Piecewise linear trend
    piecewise = TSLM(Minutes ~ trend(knots = c(1940, 1980)))
  )
```

```r
fit_trends
```

```
## # A mable: 1 x 3
##     linear exponential piecewise
##    <model>     <model>   <model>
## 1  <TSLM>      <TSLM>     <TSLM>
```

# Example: Boston marathon winning times

```
fit_trends |>
  forecast(h = 10) |>
  autoplot(marathon)
```

# Example: Boston marathon winning times

```
fit_trends |>
  select(piecewise) |>
  gg_tsresiduals()
```