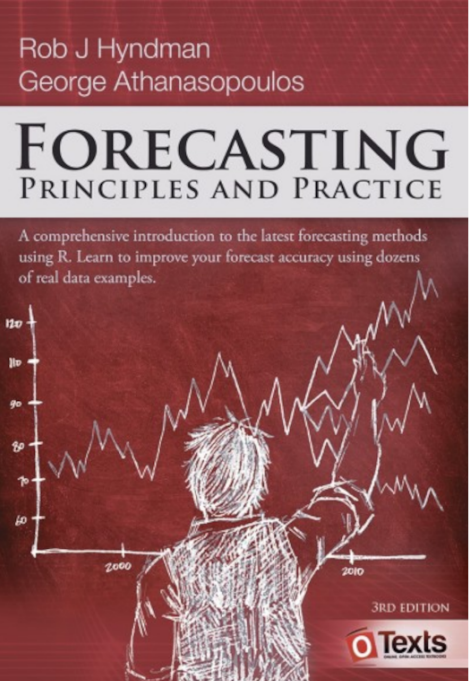


5. The forecaster's toolbox

5.1 A tidy forecasting workflow

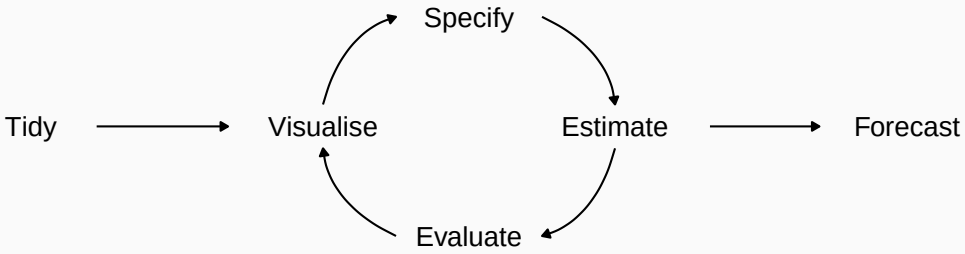
OTexts.org/fpp3/

A tidy forecasting workflow

The process of producing forecasts can be split up into a few fundamental steps.

1. Preparing data
2. Data visualisation
3. Specifying a model
4. Model estimation
5. Accuracy & performance evaluation
6. Producing forecasts

A tidy forecasting workflow



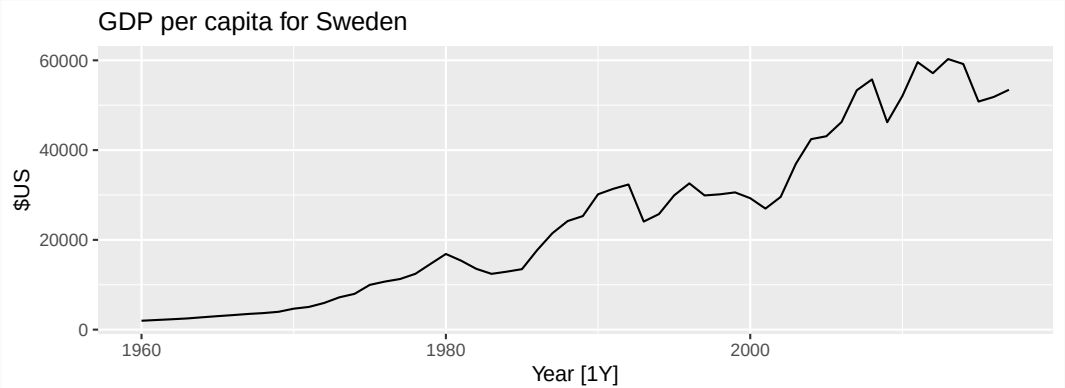
Data preparation (tidy)

```
gdppc <- global_economy |>
  mutate(GDP_per_capita = GDP / Population) |>
  select(Year, Country, GDP, Population, GDP_per_capita)
gdppc
```

```
## # A tsibble: 15,150 x 5 [1Y]
## # Key:       Country [263]
##     Year Country              GDP Population GDP_per_capita
##    <dbl> <fct>              <dbl>      <dbl>          <dbl>
##  1  1960 Afghanistan  537777811.    8996351           59.8
##  2  1961 Afghanistan  548888896.    9166764           59.9
##  3  1962 Afghanistan  546666678.    9345868           58.5
##  4  1963 Afghanistan  751111191.    9533954           78.8
##  5  1964 Afghanistan  800000044.    9731361           82.2
##  6  1965 Afghanistan 1006666638.    9938414          101.
```

Data visualisation

```
gdppc |>
  filter(Country == "Sweden") |>
  autoplot(GDP_per_capita) +
  labs(title = "GDP per capita for Sweden", y = "$US")
```



Model estimation

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

```
fit <- gdppc |>
  model(trend_model = TSLM(GDP_per_capita ~ trend()))
fit
```

```
## # A mable: 263 x 2
## # Key:     Country [263]
##    Country              trend_model
##    <fct>                    <model>
##  1 Afghanistan               <TSLM>
##  2 Albania                   <TSLM>
##  3 Algeria                   <TSLM>
##  4 American Samoa            <TSLM>
##  5 Andorra                   <TSLM>
```

Model estimation

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

```
fit <- gdppc |>
  model(trend_model = TSLM(GDP_per_capita ~ trend()))
fit
```

```
## # A mable: 263 x 2
## # Key:     Country [263]
##    Country              trend_model
##    <fct>                    <model>
##  1 Afghanistan               <TSLM>
##  2 Albania                   <TSLM>
##  3 Algeria                   <TSLM>
##  4 American Samoa            <TSLM>
##  5 Andorra                   <TSLM>
```

A `mable` is a model table, each cell corresponds to a fitted model.

Producing forecasts

```
fit |> forecast(h = "3 years")
```

```
## # A fable: 789 x 5 [1Y]
## # Key:     Country, .model [263]
##    Country        .model       Year   GDP_per_capita  .mean
##    <fct>          <chr>       <dbl>           <dist>  <dbl>
##  1 Afghanistan    trend_model  2018     N(526, 9653)   526.
##  2 Afghanistan    trend_model  2019     N(534, 9689)   534.
##  3 Afghanistan    trend_model  2020     N(542, 9727)   542.
##  4 Albania        trend_model  2018  N(4716, 476419)  4716.
##  5 Albania        trend_model  2019  N(4867, 481086)  4867.
##  6 Albania        trend_model  2020  N(5018, 486012)  5018.
##  7 Algeria        trend_model  2018  N(4410, 643094)  4410.
##  8 Algeria        trend_model  2019  N(4489, 645311)  4489.
```

Producing forecasts

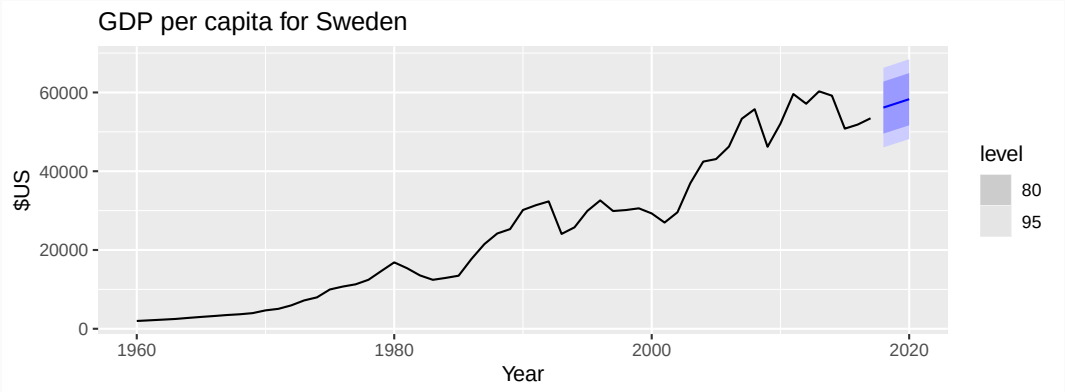
```
fit |> forecast(h = "3 years")
```

A `fable` is a forecast table with point forecasts and distributions.

```
## # A fable: 789 x 5 [1Y]
## # Key:     Country, .model [263]
##    Country        .model       Year   GDP_per_capita  .mean
##    <fct>          <chr>       <dbl>           <dist>  <dbl>
##  1 Afghanistan    trend_model  2018     N(526, 9653)   526.
##  2 Afghanistan    trend_model  2019     N(534, 9689)   534.
##  3 Afghanistan    trend_model  2020     N(542, 9727)   542.
##  4 Albania        trend_model  2018  N(4716, 476419)  4716.
##  5 Albania        trend_model  2019  N(4867, 481086)  4867.
##  6 Albania        trend_model  2020  N(5018, 486012)  5018.
##  7 Algeria        trend_model  2018  N(4410, 643094)  4410.
##  8 Algeria        trend_model  2019  N(4489, 645311)  4489.
```

Visualising forecasts

```
fit |>
  forecast(h = "3 years") |>
  filter(Country == "Sweden") |>
  autoplot(gdppc) + labs(title = "GDP per capita for Sweden", y = "$US")
```



Recap

The process of producing forecasts can be split up into a few fundamental steps.

1. Preparing data - generate a `tsibble`
2. Data visualisation
3. Specifying a model
4. Model estimation - `model() -> mable`
5. Accuracy & performance evaluation
6. Producing forecasts - `forecast() -> fable`