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# 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**  
OPEN TEXTS

## 7. Time series regression models

### 7.6 Forecasting with regression

[OTexts.org/fpp3/](https://OTexts.org/fpp3/)

# Ex-ante versus ex-post forecasts

- *Ex ante forecasts* are made using only information available in advance.
  - ▶ require forecasts of predictors
- *Ex post forecasts* are made using later information on the predictors.
  - ▶ useful for studying behaviour of forecasting models.
- trend, seasonal and calendar variables are all known in advance, so these don't need to be forecast.

# Scenario based forecasting

- Assumes possible scenarios for the predictor variables
- Prediction intervals for scenario based forecasts do not include the uncertainty associated with the future values of the predictor variables.

# Building a predictive regression model

- If getting forecasts of predictors is difficult, you can use lagged predictors instead.

$$y_t = \beta_0 + \beta_1 x_{1,t-h} + \cdots + \beta_k x_{k,t-h} + \varepsilon_t$$

- A different model for each forecast horizon  $h$ .

# US Consumption

```
fit_consBest <- us_change |>
  model(
    TSLM(Consumption ~ Income + Savings + Unemployment)
  )

future_scenarios <- scenarios(
  Increase = new_data(us_change, 4) |>
    mutate(Income = 1, Savings = 0.5, Unemployment = 0),
  Decrease = new_data(us_change, 4) |>
    mutate(Income = -1, Savings = -0.5, Unemployment = 0),
  names_to = "Scenario"
)

fc <- forecast(fit_consBest, new_data = future_scenarios)
```

# US Consumption

```
us_change |> autoplot(Consumption) +  
  labs(y = "% change in US consumption") +  
  autolayer(fc) +  
  labs(title = "US consumption", y = "% change")
```

