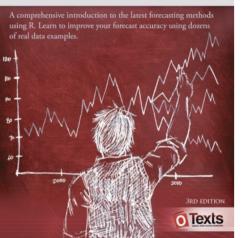
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# FORECASTING PRINCIPLES AND PRACTICE



# 7. Time series regression models

7.6 Forecasting with regression
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.

$$\mathbf{y}_t = \beta_0 + \beta_1 \mathbf{x}_{1,t-h} + \cdots + \beta_k \mathbf{x}_{k,t-h} + \varepsilon_t$$

A different model for each forecast horizon *h*.

#### **US Consumption**

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

#### **US Consumption**

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

