**Submission:**

* Include all **group members’ names and group #** at the top of the .rmd file
* 1 submission per Assignment Group featuring 1 .rmd file with code and text responses through Canvas

**FPP3 text:**

“Forecasting: Principles and Practice” <https://otexts.com/fpp3/>

ETS and ARIMA modeling

aus\_retail dataset comes with the fpp3 package (library(fpp3)) and includes monthly retail revenue by state and industry. We will model the Northern Territory and the Clothing industry.

1. Import and format data **(4 pts)**
   1. Use code below to import data



* 1. Visualize the data using autoplot: autoplot(ar, Turnover). Is the variance constant. Visualize with a log transform (autoplot(ar, log(Turnover)). Does this transformation make the variance more uniform?
  2. Split the dataset into a train and test set to compare across forecasting methods
     1. Training set is data before 2018
     2. Test set is 2018 data

1. Exponential smoothing (ETS) **(6 pts)**
   1. Fit an ETS model on the training data. Remember to transform the data with log()
      1. Example: ETS(log(Turnover))
   2. What does the model suggest about seasonality and trend in the data?
   3. Plot the residuals. What do you notice in the ACF plot?
2. ARIMA modeling **(10 pts + 1 pt EC)**
   1. Make the data stationary
      1. Take a seasonal (m=12) difference and/or nonseasonal difference to try and make the data stationary. Test if the data is stationary with the unitroot test (kpss).
      2. Plot an ACF and a PACF chart. Interpret the charts. Does this look like a pure AR or MA model after our differencing?
   2. Fit an ARIMA model to the training data
      1. ARIMA(log(Turnover))
   3. Print the report using the report() function. What are the p,d,q and P,D,Q parameters? ~~Is there an intercept?~~ Is there a drift coefficient? (1 pt EC for drift coefficient)
   4. Plot the residuals. Interpret the ACF plot.
3. Compare with benchmark models­­­­ **(10 pts)**
   1. Re-fit ETS, ARIMA models to the training dataset (allow R do the model selection for all ARIMA and ETS parameters).
   2. Can AICc be used to compare the model performance?
   3. Forecast the data (using forecast(new\_data = test)) on your test dataset. Then use the accuracy function with the forecast and ar object created in part 1.
      1. Example:
         1. fit\_model\_compare %>% forecast(new\_data = test) %>% accuracy(ar)
   4. Plot the forecasts against the test dataset
   5. Which model has the lowest MASE?