

Economics 403B: Project 2
Winter 2018, UCLA
Instructor: Dr. Rojas

Due Date: Feb 12, 2018

For this project you will fit a forecasting model with both trend and seasonal dummies. You may choose any data of your choice provided your time-series data includes the presence of both a trend and seasonality. Preferably use monthly or weekly observations for a period of at least 20 years.

The assignment that you will submit, consists of a written report which includes answers to questions below (including plots), and R source code.

Make sure all the plots conform to the standards discussed in class, e.g., correct time units, axis labels, legends, etc.

Your report needs to be typed in LaTeX (no limit on the number of pages) and will consist of 5 parts:

I. (3%) Introduction (describe the data, provide some background on the topic, etc.).

II. (72%) Results (answers and plots). Consists of three parts:

1. Modeling and Forecasting Trend (4% each)

- (a) Show a time-series plot of your data.
- (b) Does your plot in (a) suggest that the data are covariance stationary? Explain your answer.
- (c) Plot and discuss the ACF and PACF of your data.
- (d) Fit a linear and nonlinear (e.g., polynomial, exponential, quadratic + periodic, etc.) model to your series. In one window, show both figures of the original times series plot with the respective fits.
- (e) For each model, plot the respective residuals vs. fitted values and discuss your observations.
- (f) For each model, plot a histogram of the residuals and discuss your observations.
- (g) Perform a Jarque-Berra Test on the two sets of residuals and discuss your results.
- (h) Plot and discuss the ACF and PACF of the residuals from each one of your model fits.
- (i) For each model, discuss the associated diagnostic statistics (R^2 , t -distribution, F -distribution, etc.)
- (j) Select a trend model using AIC and BIC (show the values obtained from each criterion). Do the selected models agree?

- (k) Use your preferred model to forecast h -steps (at least 16) ahead. Your forecast should include the respective uncertainty prediction interval. Depending on your data, h will be in weeks, months, etc.

2. Modeling and Forecasting Seasonality (4% each)

- (a) Construct and test (by looking at the diagnostic statistics) a model with a full set of seasonal dummies.
- (b) Plot the estimated seasonal factors and interpret your plot.
- (c) In order to improve your model, add the trend model from problem 1 to your seasonal model. We will refer to this model as the full model. For the full model, plot the respective residuals vs. fitted values and discuss your observations.
- (d) Interpret the respective summary statistics including the error metrics of your full model.
- (e) Perform a Jarque-Berra Test on the residuals and discuss your results.
- (f) Plot and discuss the ACF and PACF of the residuals. How do these plots compare to 1(h)?
- (g) Use the full model to forecast h -steps (at least 16) ahead. Your forecast should include the respective prediction interval.

III. (10%) Conclusions and Future Work (state your conclusion regarding your final model and forecast, and provide some insight as to how it could be improved).

IV. (5%) References (include the source of your data and any other resources).

V. (10%) R Source code. Your code needs to include proper comments to help e.g., a non-R expert understand and run your code. If you do not submit your code, you will not receive credit for the assignment.