STAT 4848/6948 • APPLIED REGRESSION & TIME SERIES • SPRING 2020 • KERNS

Final Exam (Take Home)

DUE: Friday, May 1, 2020 @ 11:59PM

Your Dataset Number: `r01`

Directions: Complete the exam just like you would any other exam and upload your R Markdown `.Rmd` file on Blackboard by the deadline.

You are permitted to discuss the exam with your classmates, you are permitted to discuss it with me, but every student is responsible to upload his/her own work to Blackboard under the Honor System.

The Data

Your data (think of them as earnings) are stored in `r01`. You can put the following command in your R Markdown file to load the data:

```
load(url("http://gkerns.people.ysu.edu/examF.RData"))
```

You can also download the file and load it locally; pick your favorite.

Questions

1. Plot the time series and also the logarithm of the series. Argue that we should transform by logs to model this series. Does a stationary model seem reasonable under a logarithm transformation alone?

2. Take first differences (of the logs) and plot that series. Does stationarity now seem reasonable? Why or why not?

3. Make another plot with plotting symbols that will help you assess seasonality.

4. Calculate and graph the sample ACF of the first differences. Interpret the results. At which lags do you have significant autocorrelation?

5. Display a plot of seasonal differences and first differences. Interpret the plot. Recall that for quarterly data, a season is of length 4.

6. Graph and interpret the sample ACF of seasonal differences with the first differences.

7. Fit the model $ARIMA(0,1,1) \times (0,1,1)_4$, and assess the significance of the estimated coefficients.

8. Perform all of the diagnostic tests on the residuals.
9. Overfit with an $ARIMA(0,1,2) \times (0,1,1)_4$ model. Interpret the results.
10. Calculate and plot forecasts for the next two years of the series. Be sure to include forecast limits.

Assignment Deliverables:

Submit your R Markdown `.Rmd` file through Blackboard by the due date, Friday, May 1, 2020 @ 11:59PM. (Early submission is encouraged.)