Assignment 7

3 Possible Points

This assignment's due date is Thursday, July 6th by 8:00 PM. The grading policy for late assignments can be found in the syllabus. You are strongly encouraged to work in groups of up to 4 students, but each of you must submit his/her own version of the assignment. Please put the names of your group members in a comment in the program.

Write a single text file that contains all of your work for this assignment. Name it ps7_[yourlastname].txt - for example, mine would be ps7_hoff.txt The text file should submit all of the commands necessary to answer the questions. Please put the answers to the **bold questions** in a comment line in your text file, even if you think the answer is readily apparent.

In this assignment you will identify and test for structural breaks in time series data. The data can be found on the course website in a CSV file titled "ps7". Note that you should not include an intercept in your models.

Installing a package in R

- Install the packages `"tseries"` and `"strucchange"`.
- Either click on the boxes next to `tseries` and `strucchange` in the packages tab in RStudio **OR** use this piece of R code: `library(tseries)` and `library(strucchange)`.

Time Series $\{z3_t\}$

Consider the series $\{y1_t\}$ that is generated by an AR(2) process with a structural break.

- Plot the data.
- **Does the data appear to be stationary?**
- Plot the ACF.
- **Does the data appear to be stationary according to the ACF?**
- Plot the data and attempt to identify where the structural break occurs
  - It may help to look at the data around where you think the break occurs
- **Identify where you think the break occurs (for example t=12) and perform a Chow test to test whether or not the break is statistically significant. Perform both versions of the Chow test (dummy variable and F-test).**
  - One way to create the dummy variable use the following R code:
    - `dummy_pre <- 1:1000`
    - `dummy <- ifelse(dummy_pre < 12, 0, 1)`
    - NOTE that I used `12` in the `ifelse` statement just as an example, you will put the number where you think the break occurs.
- **Clearly state the results of your Chow Tests.**

- Use the `arima()` function to model $\{y1_t\}$.

- **Use the entire series and report the parameter estimates and whether or not they are statistically significant.**

- Break the series into pre- and post-break samples based on your analysis above.
  - Suppose you think that the break occurs at t=12. One way to break the series into two would be:

```
z1 <- y1[1:11]
z2 <- y1[12:1000]
```

- Use the `arima()` function to model the pre- and post-break samples.

- **Compare your estimated parameters from the full sample to the pre- and post-break estimations. Use statistical language when possible.**

- Use the function `efp()` to identify the structural break using CUSUM. The following piece of code will do this for the entire series
  - `plot(efp(y ~ lag(y, k=-1) + lag(y, k=-2), type="Rec-CUSUM"))`
  - Note that what is being plotted are the residuals

- **Does the CUSUM show a structural break?**

- **What does the plot confirm about the CUSUM test?**

- Plot the ACF for the pre- and post-break periods separately.

- **Do these data appear to be stationary? What does this tell you about the importance of identifying structural breaks?**