Problem Set 2: ARIMA Modeling

Parameters

- Feel free to work in groups however your code and your write-ups on each question should be your own.

- Submissions can be made through blackboard.

- Your submission is due by 11:59pm on the due date listed in blackboard.

- Late submissions will not be accepted unless previously arranged.

- Your submission should contains two files: a PDF or Word file with your write-up and a .R (or similar script) file with your commented code.

- Make sure your answer is sufficient for a reader that is not familiar with the problem and/or time series to understand your solution.

- Treat your write up like a professional report. If you wouldn't turn it into your boss, don't turn it in to me.

Question 1:

Located on Blackboard you will find a ".Rda" file with data for this question. The file contains two time series, 'problem_1' and 'problem_2'. The data is simulated so there is a known data generating process. Complete the following for the series labled 'problem_1':

1. Determine the order of integration for this series. Provide all available information to support your conclusion.

2. Do you think this data is seasonal? Why or why not? This is not a simply yes or no answer, you must justify your response with enough evidence to convince the reader of your conclusion.

3. Evaluate the ACF and PACF as we have done in class. Is this an AR model or an MA? If it is seasonal, is the seasonal component an AR or MA? Why?

4. From the ACF and PACF identify a starting model to implement a general to specific analysis. Justify your choice.

5. Prior to estimating a model; choose an information criterion, define it, and explain its relative strengths compared to any alternatives you considered. Be specific in your definition.

6. Estimate your starting model and provide the results for this model and two other more specific models you considered in your general to specific approach. These should come in a table format that looks similar to that found below. Identify your "best" model of the three.

7. Define serial correlation and explain why it is an important diagnostic to consider for your models.

8. Evaluate the residuals of your model for serial correlation and provide the results of any tests you conduct and fully explain them.

Parameter	Model 1	Model 2	Model 3
Deterministic Parameters			
α			
δ			
ARMA Parameters			
ϕ_1			
$\vdots$			
ϕ_p			
θ_1			
$\vdots$			
θ_q			
Seasonal Parameters			
Φ_1			
Θ_1			
January			
Order of Integration			
Information Criterion			
Diagnostic Test Statistics			

Any notes about your table should go here (e.g., standard errors in parentheses, significance levels, etc.)

Question 2:

Complete the following for the series labeled 'problem_2':

1. Determine the order of integration for this series. Provide all available information to support your conclusion.

2. Do you think this data is seasonal? Why or why not? This is not a simply yes or no answer, you must justify your response with enough evidence to convince the reader of your conclusion.

3. Evaluate the ACF and PACF as we have done in class. Is this an AR model or an MA? If it is seasonal, is the seasonal component an AR or MA? Why?

4. From the ACF and PACF identify a starting model to implement a general to specific analysis. Justify your choice.

5. Estimate your starting model and provide the results for this model and two other more specific models you considered in your general to specific approach. These should come in a table format that looks similar to that found below. Identify your "best" model of the three.

6. Evaluate the residuals of your model for serial correlation and provide the results of any tests you conduct and fully explain them.

Question 3:

Go to the FRED website or use the API to download the series "ADPWINDCONNERSA" for the period 1985-11-01 to 2015-10-01. This series is Nonfarm Private Payroll Employment for Construction. The series is originally a weekly series but I would like you to use the monthly representation with an average aggregation method. These are options on the FRED site and in the R package we have used in class. Complete the following on this data set:

1. Determine the order of integration for this series. Provide all available information to support your conclusion.

2. Do you think this data is seasonal? Why or why not? This is not a simply yes or no answer, you must justify your response with enough evidence to convince the reader of your conclusion.

3. Evaluate the ACF and PACF as we have done in class. Is this an AR model or an MA? If it is seasonal, is the seasonal component an AR or MA? Why?

4. From the ACF and PACF identify a starting model to implement a general to specific analysis. Justify your choice.

5. Estimate your starting model and provide the results for this model and two other more specific models you considered in your general to specific approach. These should come in a table format that looks similar to that found below. Identify your "best" model of the three.

6. Evaluate the residuals of your model for serial correlation and provide the results of any tests you conduct and fully explain them.