

MAS3911/8911 Time Series Project

Newcastle University

Semester 2, 2019-20

1 Introduction

For this project you will be given a time series. Each group will be given different data (see 2 below) but, in each case, the series is meant to represent monthly total electricity consumption in a city over a ten-year period, from January 2006 to December 2015. The units are millions of kilowatt-hours (10^6 kWh).

You are to identify and fit a suitable time series model to the data. This model is to be used for forecasting and you should produce a forecast for the period January to June 2016. You should also assess the reliability of your forecasts. Further details are given in Section 3 below.

Your work should be presented as a report. There will be marks for the quality and presentation of this report. See Section 4 below.

2 Data

The file `projectdata.txt` is available from Blackboard. Obtain a copy of this file and save it in the directory which will be your working directory when you use R for the analysis (or else modify the instructions below).

Each student group is given a reference number in the table in Section 6 at the end of this document. Your data are in the column of the file corresponding to your reference number. So, for example, if your reference number is 79, then the following R commands will give you your data in a vector named `y`.

```
>data<-read.table("projectdata.txt")
```

```
>y<-data[,79]
```

You must use your correct data. I will be checking.

If you have any difficulty obtaining your data, let me know. You should obtain your data straight away to avoid difficulties later.

3 Tasks

3.1 Modelling

Using methods covered in the module, identify and fit a suitable model for the data. You should use the steps of the iterative approach to modelling, with identification,

estimation and diagnostic checking, repeated as necessary. You should consider whether it would be better to fit the model to the data as they are or whether it would be better to apply a transformation to the data.

You should explain your analysis clearly, illustrate it with suitable tables and graphs and state your conclusions clearly.

3.2 Forecasting

You are to produce forecasts of monthly electricity consumption for the period January-June 2016 inclusive. You should provide 95% forecast limits.

In order to assess the reliability of your forecasting method, you should also fit your model using only the first nine years of data and then forecast the next twelve months and compare the forecast with the actual values.

Comment on your findings.

3.3 Report

You should present your work in the form of a report. This should be well structured and written. It should have sections, beginning with an introduction and ending with conclusions. You should comment on the behaviour of the time series. For example, does electricity consumption seem to be increasing or decreasing? You should explain your analysis clearly. Illustrate your work with suitable graphs and tables. Your conclusions should be clearly stated.

You should give important pieces of R code which you have used either at appropriate points in the main body of the report or in an appendix. If you use an appendix then refer to the code in the appendix at appropriate points in the main body of the report. What you should *not* do is simply submit R code and output with a few comments inserted.

4 Marking

This project counts for 10% of the marks for MAS3911. It will be marked according to the following scheme.

Model identification and fitting: (50 marks) Use (at least) the methods covered in the course to identify a suitable model, fit it and check that it appears to be satisfactory. You should check carefully that the model is appropriate, as described in the module. Explain and present your analysis clearly and state your conclusion.

Forecasting: (15 marks) This covers both the forecast (with limits) for January-June 2016 and the testing of the forecast. Again, explain your analysis and state your conclusion clearly.

Report and presentation: (20 marks) Your report should be well structured and written. See 3.3 above.

Bonus marks: (15 marks) These marks are included to give extra marks for especially good features, use of initiative and imagination *etc*, for example using an appropriate method which is not specifically covered in the module or particularly good features of the presentation. They will be used only sparingly. Remember that a mark of 70% corresponds to first class honours and there are 85 marks available without any bonus marks.

5 Submission

Your report should be submitted through Blackboard with a deadline of 3.00pm on **Thursday May 7th**.

6 Student Reference Numbers

See list on Blackboard.