STATS 326
Applied Time Series
ASSIGNMENT ONE
Due: 28 March, 11.00 am

(Worth 6% of your final grade)

Hand-in to the appropriate STATS 326 Hand-in box in the Student Resource Centre

For each of the first 4 questions in this assignment you are required to find a Univariate Time Series data set, describe the Time Series data set you are using, state where you found the data (web address is fine), do a Time Series plot of the data in **R** (see page 14 of the Course Notes) and describe the main features you see in the plot.

Each Time Series data set you use can come from the web, journal articles, text books etc. You must **NOT** use any Time Series that are used as examples in the course (see page v of your Course Notes for a list of the Time Series data sets that are used as examples in the Lecture Notes and page 243 for a list of the Tutorial data sets). It would also be advisable to look at pages 55 – 59 and pages 244 – 248 before commencing this assignment.

This assignment will be marked out of 100 with each question worth 20 marks. Each question should take no more than 1 side of A4 paper. You are encouraged to print your assignment "2-up" to save paper.

Question One: [20 marks]

Find a Time Series that exhibits cycles. (See pages 55 – 58 of the Course Notes.)

Question Two: [20 marks]

Find a Stationary Time Series. (See page 3 of the Course Notes.)

Question Three: [20 marks]

Find a Time Series that has a seasonal component but no trend or cycle. (See pages 55 – 59 of the Course Notes.)

Question Four: [20 marks]

Find a Time Series that has a reasonably linear trend and a seasonal component. (See page 55 and pages 58 – 59 of the Course Notes.)

Question Five: [20 marks]

The data contained in the file "Barrow 2000 - 2017.txt" records the average concentration of CO2 in the atmosphere at Barrow in Alaska, USA for each month from January 2000 to December 2017.

Load the data into **R**, create a "time series object" and produce a time series plot. Copy the plot into your assignment.

Using the `aggregate` function in **R**, convert the data into the average concentration of CO2 in the atmosphere for each quarter from 2000 to 2017. (Include the **R** commands you used to aggregate the data in your assignment.) Plot the quarterly series, copy the plot into your assignment and describe the plot.

Data Source: NOAA ESRL Global Monitoring Division. 2017, updated annually. Atmospheric Carbon Dioxide Dry Air Mole Fractions from quasi-continuous measurements at Barrow, Alaska. Compiled by K.W. Thoning, D.R. Kitzis, and A. Crotwell. National Oceanic and Atmospheric Administration (NOAA), Earth System Research Laboratory (ESRL), Global Monitoring Division (GMD): Boulder, Colorado, USA. Version 2018-10 at http://dx.doi.org/10.7289/V5RR1W6B

HINT: See page 233 of the Course Notes. Here we aggregate monthly data into annual data. The original frequency was 12 and the new frequency is 1 (in **R**: `nfrequency = 1` which is the default setting so was not required as an argument in the **R** command). Our data for this question is monthly (frequency = 12). The new frequency is 4 (in **R**: `nfrequency = 4`).

NOTE: Check that the quarterly averages appear consistent with the original monthly averages.