

# AAEC 4984/5984 – Applied Economic Forecasting

## *Homework Solution Sample Template*

*Spring 2020*

This template will provide a guide to what I anticipate that your homework solutions will look like. Please feel free to exercise your creativity when producing your solutions however.

- Unless stated, please display the R chunk that produced your results.
- To do a quick spell check of your document please press **F7** on your keyboard.
- Whenever appropriate, please refer to the output. Please take a look at the `.Rmd` here to see how I am able to (i) Add captions to my plots, (ii) hyperlink and reference the plots, and (iii) embed the results stored in the R chunks into my text.

### Question 1: Generating random variables

- Generate a random normal variable, `x1`, that has 50 observations, a mean of 75, and standard deviation of 5. That is  $x1 \sim N(75, 5^2)$ .
- Use a seed of 12345.
  - set `x1` as a ts object (`x1.ts`). Let R use its default frequency, start, end arguments.
  - Plot `x1.ts`

```
set.seed(12345)
x1 <- rnorm(50, mean = 75, sd = 5)
x1.ts <- ts(x1)
autoplot(x1.ts, col = "green4") + ggtitle("Plot of x1") + labs(x = "", y = " ")
```

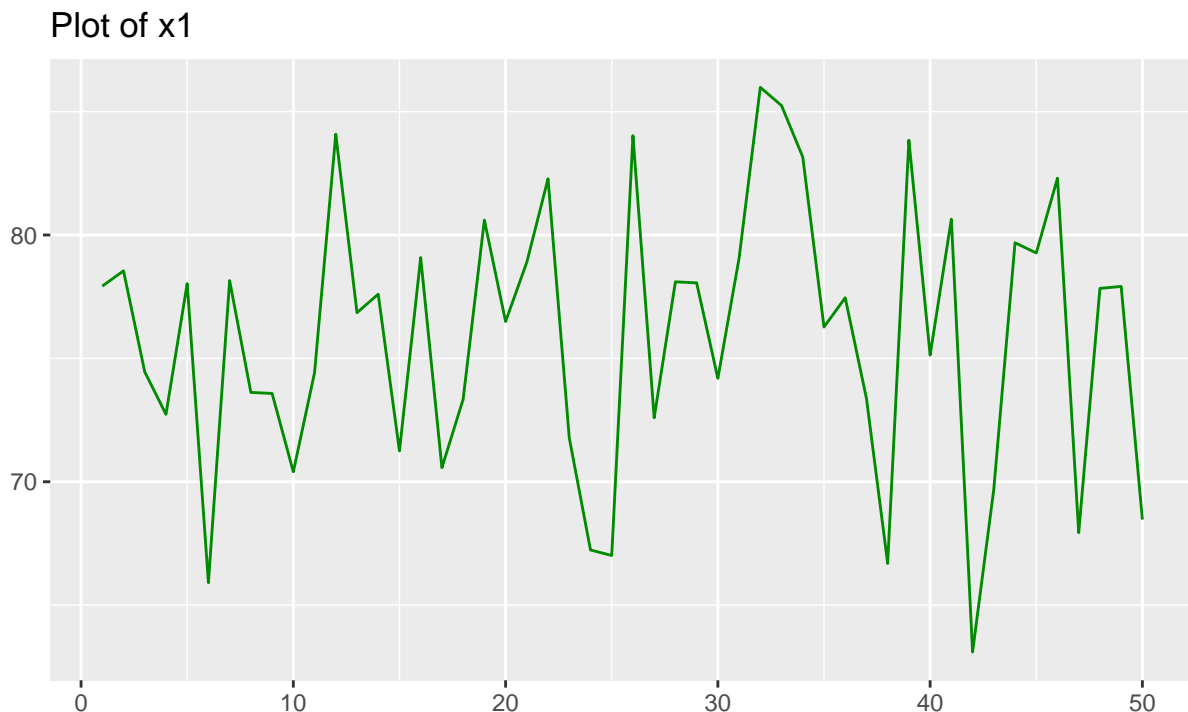


Figure 1: Time Plot of X1

ii. Do you notice any discernible patterns in the plot?

The observations of  $x_1$  in Figure 1 appear to be random with no discernible pattern.

iii. How does the mean and standard deviation of this sample compare to the population values?

```
meanx1 <- round(mean(x1),3)
stdx1 <- round(sd(x1),3)
```

The random draw of 50 observations has a mean of 75.898 and a standard deviation of 5.483. These are not too far off from their respective population values of 75 and 5.

## Question 2: White Noise

i. Plot the ACF of this series and comment on your observations.

```
ggAcf(x1.ts, col = "blue4", lag.max = 24) + ggtitle("ACF Plot of x1")
```

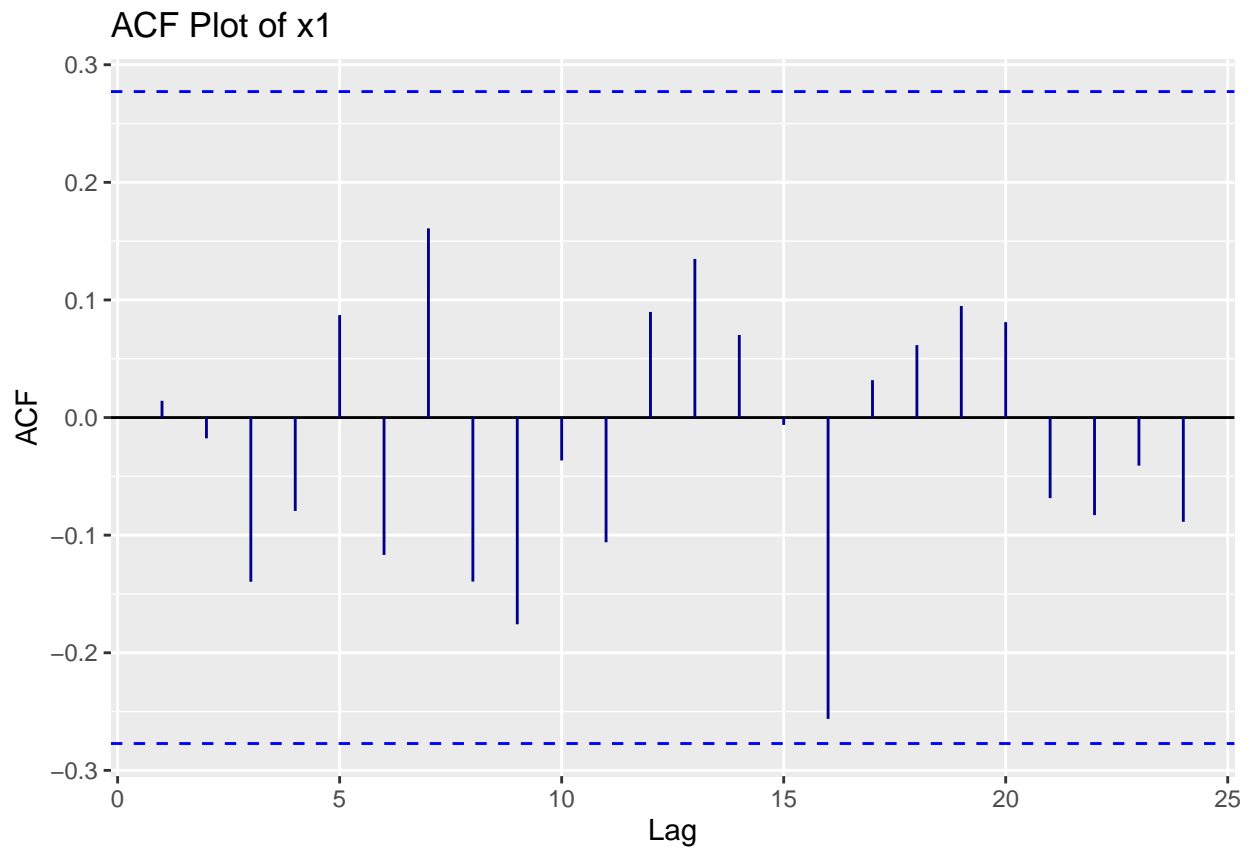


Figure 2: ACF Plot of  $X_1$

From the plots in Figure 2, all the autocorrelation statistics are within the 95% significance bands. Therefore, the  $x_1$  series is not distinguishable from a white noise process.