Applied Economic Forecasting

Homework Solution Sample Template

This template will provide a guide of what I anticipate that your homework solutions will look like. However, please feel free to exercise your creativity when producing your solutions.

1. Unless stated, please display the R chunk that produced your results.

2. Please ensure you do a quick spell check of your document. Press **F7** on your keyboard.

3. All tables, graphs, and figures must be accompanied by an appropriate title. Graph axes must be labeled, where appropriate.

- **Whenever appropriate, please try to refer to the output.** Please take a look at the `.Rmd` file in this template to see how I am able to:

i. Add captions to my plots,
ii. hyperlink and reference the plots automatically, and
iii. embed the results of variables computed and stored in the R chunks into my text. Gone are the days when you have to memorize the result and then type it over in your word document. Once you have it stored as a variable, you can directly extract it in the document text.

Question 1: Generating random variables

i. Generate a random normal variable, `x1`, that has 100 observations, a mean of 5, and standard deviation of 5. That is $x1 \sim N(5, 5^2)$.

- Use a seed of 01212023.
- make `x1` a `tsibble` object (`x1.ts`). Assume that `x1.ts` represents *quarterly* values up to and including December 2021. **It might prove helpful to first declare as a `ts` object then use the `as_tibble` function.**
- Using the `autoplot` function, plot `x1.ts`.

```
set.seed(01212023)
x1 <- rnorm(100, mean = 5, sd = 5)
x1.ts <- x1 %>% ts(end = c(2021,12), frequency = 4) %>% as_tsibble()
x1.ts %>% autoplot(value, col = "green4") +
  labs(title = "Plot of x1", x = NULL , y = NULL)
```
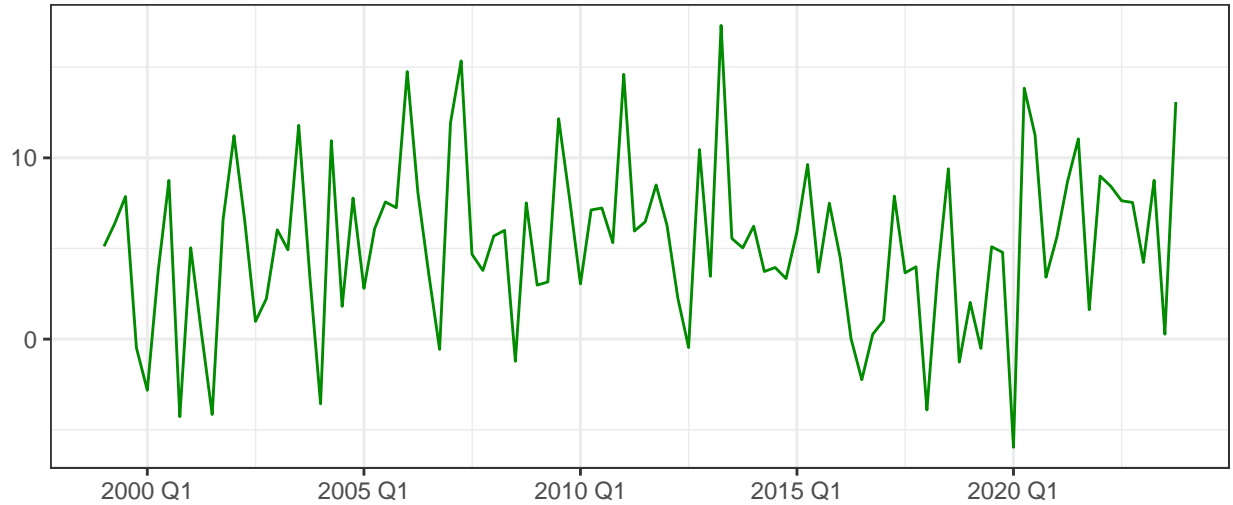
Figure 1: Caption of Plot

ii. Do you notice any discernible patterns (think trend, cycle, seasonality) in the plot?

The observations of x1 in Figure 1 appear to be random with no discernible pattern.

iii. How do the sample mean and standard deviation compare to the population (true) values?

```
meanx1 <- round(mean(x1),3)
cat("The sample mean is:", meanx1, "\n")
```

```
## The sample mean is: 5.248
```

```
stdx1 <- round(sd(x1),3)
cat("The sample standard deviation is:", stdx1, "\n")
```

```
## The sample standard deviation is: 4.609
```

The random draw of 100 observations has a mean of 5.248 and a standard deviation of 4.609. These are not too far off from their respective population values of 5 and 5, respectively.

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Question 2: White Noise

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

```
x1.ts %>% ACF(value, lag_max = 24) %>%
  autoplot() +
  labs(title = "ACF Plot of x1")
```
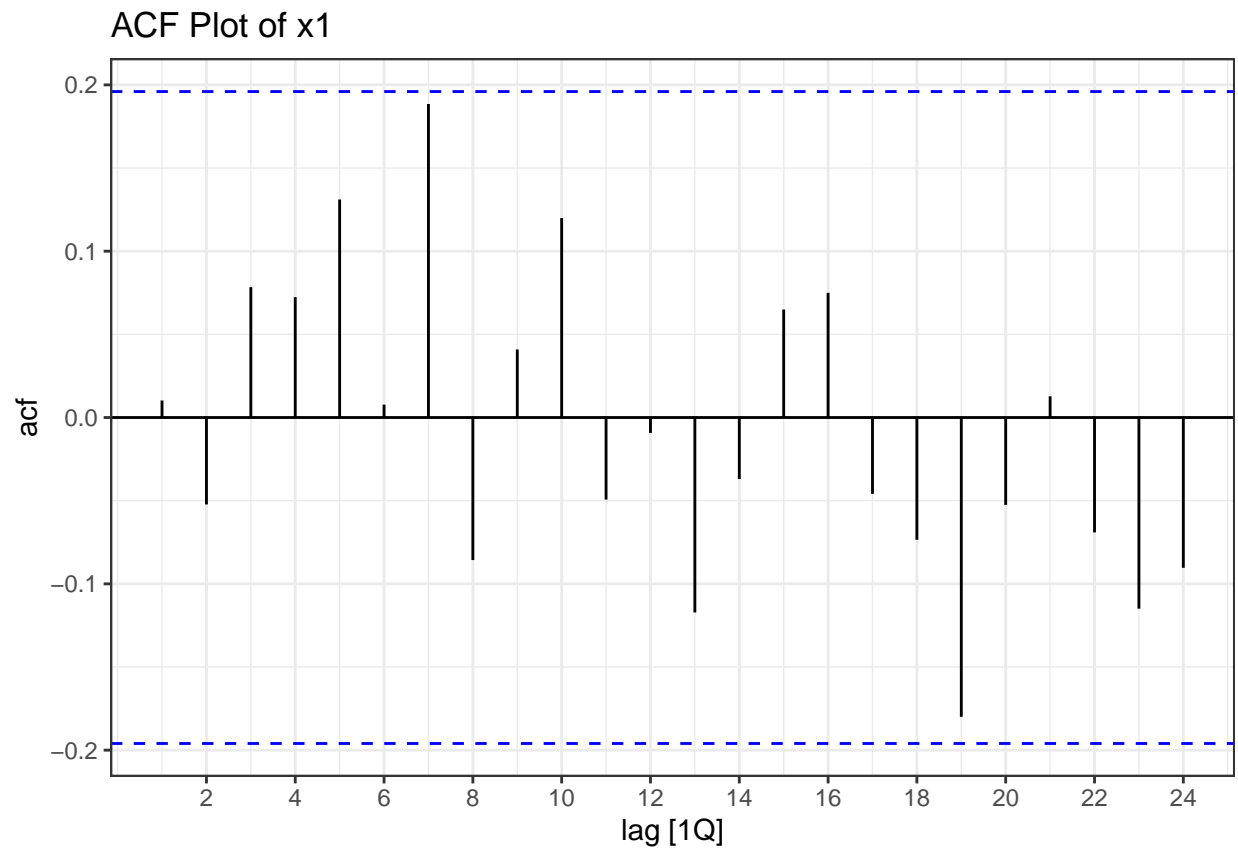

Figure 2: ACF Plot of X1

From the plots in Figure 2, all the autocorrelation statistics are within the 95% significance bands. Therefore, we can conclude that the series, x1, is not distinguishable/different from a white noise process.