

Applied Economic Forecasting

Homework Solution Sample Template

This template provides a guide of how I anticipate that your homework solutions will look. 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. An appropriate title must accompany all tables, graphs, and figures. 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 had 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 a 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. **For simplicity, I first declared a `ts()` object and then used 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_tibble()
x1.ts %>% head() #Viewing the first 6 rows of the new data
```

```
## # A tsibble: 6 x 2 [1Q]
##   index value
##   <qtr> <dbl>
## 1 1999 Q1  5.12
## 2 1999 Q2  6.38
## 3 1999 Q3  7.87
## 4 1999 Q4 -0.470
## 5 2000 Q1 -2.82
## 6 2000 Q2  3.72
```

```
x1.ts %>% autoplot(value, col = "green4") +
  labs(title = "Plot of x1", x = NULL, y = NULL)
```

Plot of x1

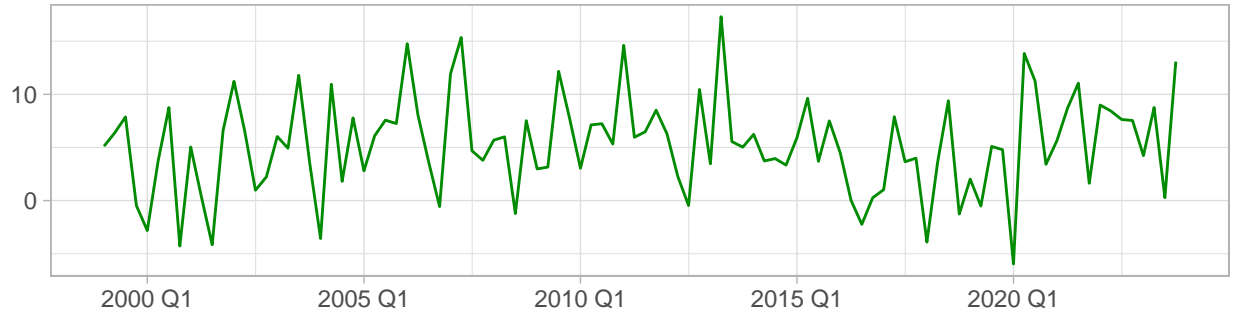


Figure 1: Place caption for your plot here

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

Answer: 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 (actual) values?

```
meanx1 <- mean(x1)
stdx1 <- sd(x1)
```

Answer: The random draw of 100 observations has a mean of 5.248 and a standard deviation of 4.609. These are pretty close to their respective population values of 5 and 5, respectively.

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")
```

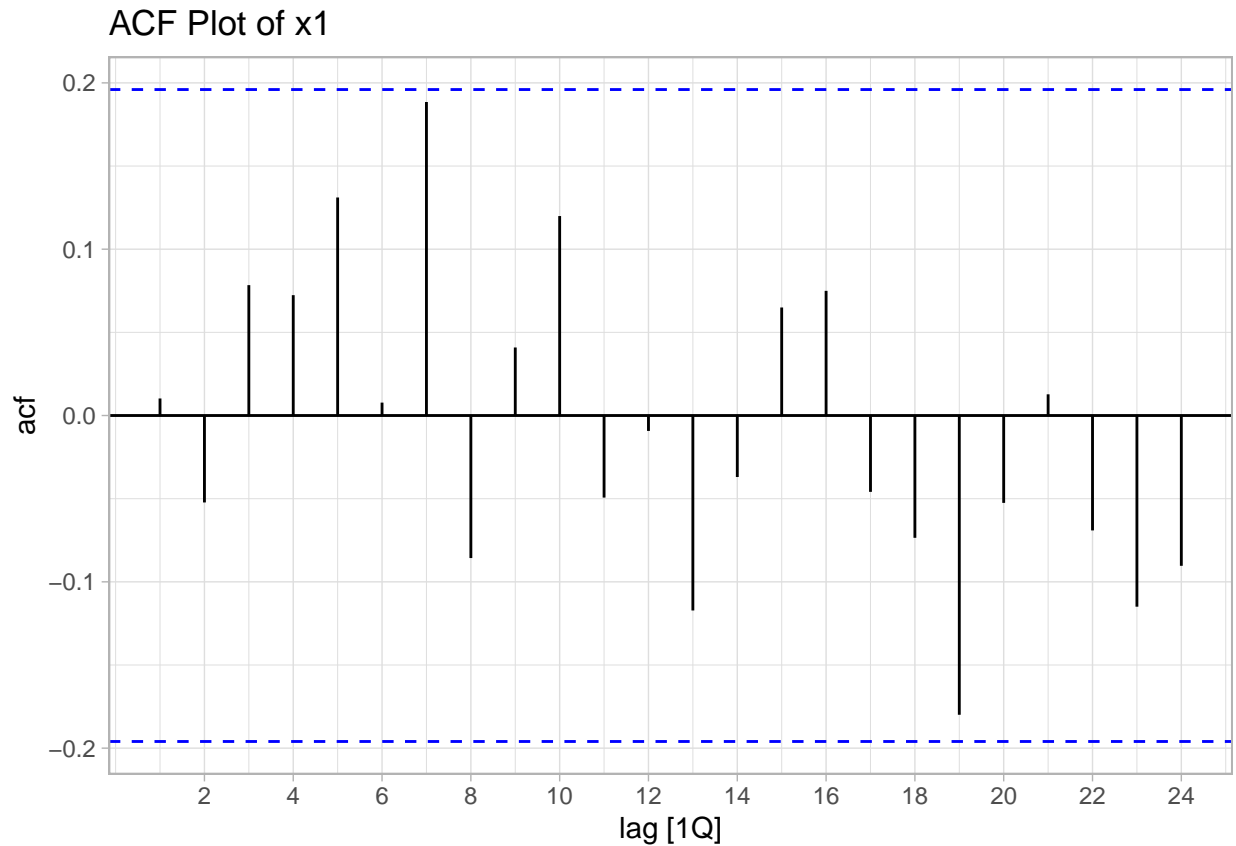


Figure 2: ACF Plot of X1

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.