Name: Your name here
Due: 2024/10/07

Homework 4

Be sure to submit **both** the .pdf and .qmd file to Canvas by Monday, October 7th at 11:59 pm.

0. [1 pt] With whom did you work on this assignment?

1. [pt] We will focus on a data set describing weekly avocado sales volume and price in the United States between 2015 and 2018 for this question.

   a) [1 pt] Read the data in (naming it `avocado`) and filter to sales of conventional avocados in `SanFrancisco`.

```
# load the data, sort by date and filter to conventional sales in San Fran
avocado <- readr::read_csv("avocado.csv") %>%
  arrange(Date) %>%
  filter(
    region == "SanFrancisco",
    type == "conventional"
  )
```

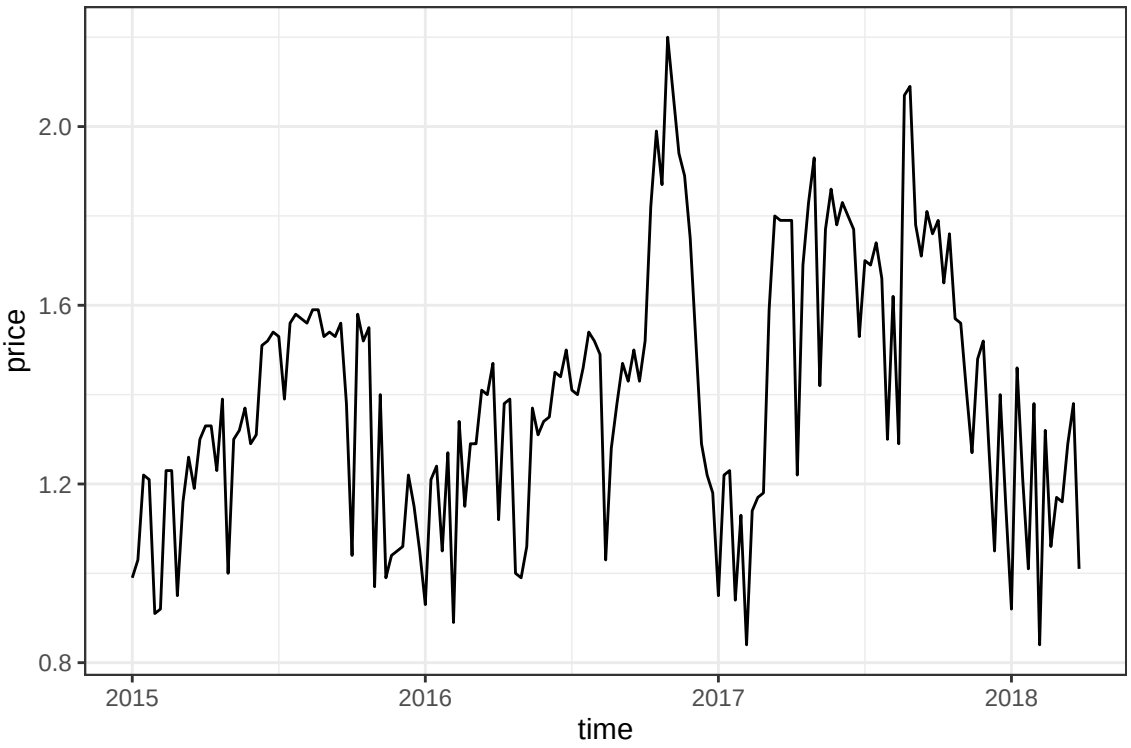
   b) [2 pt] Create a `ts` object with the `AveragePrice` vector (called `avo_ts`) and plot the series.

> **Tip**
>
> Be sure to pay attention to how the data set is arranged with respect to date. Additionally, **do not** specify an end date. This is one way to handle the fact that there are 53 Sundays in 2017 (omitting an end date forces R to treat the week that begins on 12/31/2017 as the first week of 2018).

```
# construct weekly ts
avo_ts <- ts(
  avocado$AveragePrice,
  start = with(avocado, c(year(Date[1]), week(Date[1]))),
  freq = 52
)

# plot
tibble(
  price = avo_ts,
  time = time(avo_ts)
```

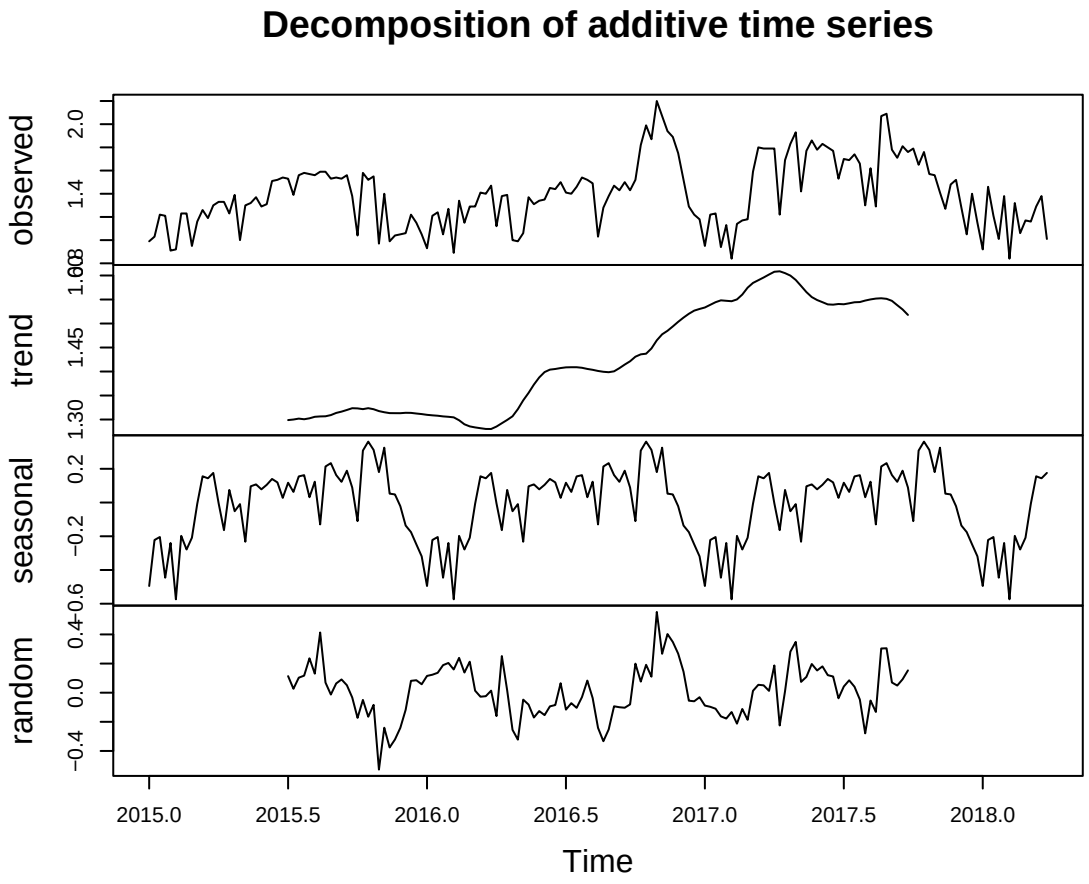
```
) %>%
  ggplot(aes(x = time, y = price)) +
  geom_line() +
  theme_bw()
```



c) [2 pt] Describe the series in terms of trend and seasonality. Decomposing the series might help.

> There is evidence of a positive trend over time, with some seasonality to the prices. In particular, prices seem to drop in winter.

```
# construct weekly ts
plot(decompose(avo_ts))
```



d) [1 pt] Create a reduced version of the `avo_ts` time series, called `avo_ts_red`, that only spans 2015 to 2017.

```
avo_ts_red <- window(
  avo_ts,
  start = c(2015, 1),
  end = c(2017, 52)
)
```

e) [1 pt] Fit an additive Holt-Winters model, called `avo_hw1`, to the reduced time series and allow R to estimate the smoothing parameters.

```
avo_hw1 <- HoltWinters(
  avo_ts_red
)
```

f) [1 pt] Create an object, called `avo_hw1_pred`, that predicts the first 13 weeks of 2018 and include prediction intervals.

```r
avo_hw1_pred <- predict(
  avo_hw1,
  n.ahead = 13,
  prediction.interval = TRUE
)
```