

# Assignment 1

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## Question 4

1 -> a

Clear seasonality in what appears to be 6 month intervals in the time plot. Matching seasonality in the ACF plot, also in these 6 month intervals.

2 -> c

The only one with a clear trend. Also there appears to be seasonality in both the time plot and the ACF plot.

3 -> b

It appears this time plot takes place over about 80 years. No clear seasonal trend, although it might be cyclical. ACF plot confirms the lack of seasonality.

## Question 5

### Question 5 Part a

```
set.seed(1000)
rv = rnorm(10, mean = 2.3, sd = 1.2)

print(mean(rv))
```

```
## [1] 1.905091
```

```
print(sd(rv))
```

```
## [1] 0.8369342
```

I am not satisfied with these results. Both the mean and standard deviation are far from our expected mean and standard deviation. Because of the extremely small sample size we can expect a high amount of variability which shows here. I suspect increasing the sample size to 10000 will fix this issue in the next problem

### Question 5 Part b

```
rv1 = rnorm(10000, mean = 2.3, sd = 1.2)

print(mean(rv1))
```

```
## [1] 2.301349
```

```
print(sd(rv1))
```

```
## [1] 1.194512
```

As expected, increasing the sample size to 10000 resolves our issues with variability. What was once now a difference of .4 from our mean is now only a difference of .001. Similarly our standard deviation went from a difference of .4 to only .01. I am now very satisfied with these results.

## Question 6

### Question 6 Part a

```
# help("AirPassengers")
# help("JohnsonJohnson")
```

The Box & Jenkins airline data is a monthly total of international airline passengers from 1949 to 1960

The Johnson & Johnson dataset reports quarterly earnings in dollars per J&J share from 1960 to 1980

### Question 6 Part b

```
start(AirPassengers)
```

```
## [1] 1949    1
```

```
end(AirPassengers)
```

```
## [1] 1960   12
```

```
frequency(AirPassengers)
```

```
## [1] 12
```

```
start(JohnsonJohnson)
```

```
## [1] 1960    1
```

```
end(JohnsonJohnson)
```

```
## [1] 1980    4
```

```
frequency(JohnsonJohnson)
```

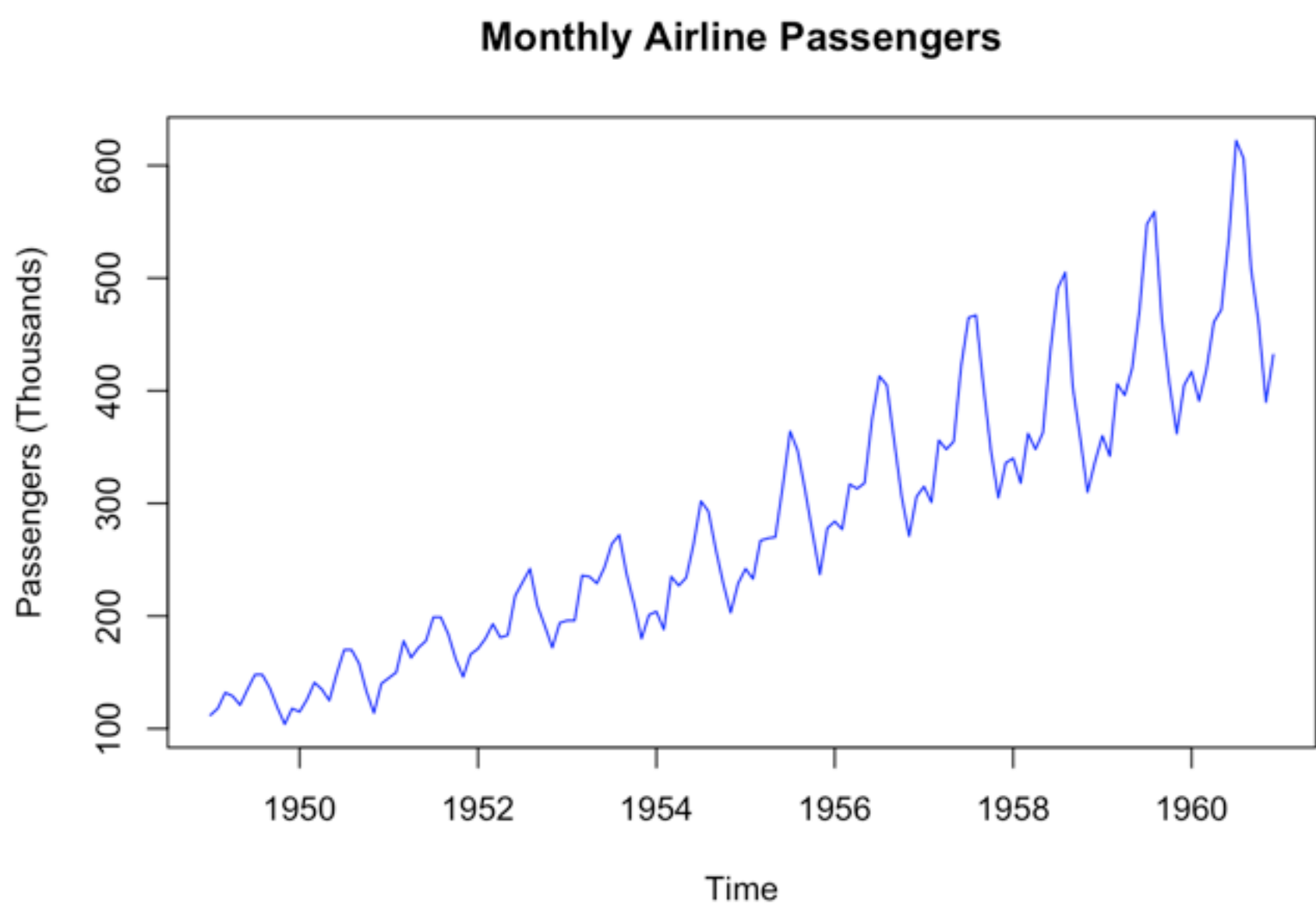
```
## [1] 4
```

The Air Passengers data set begins in the first month (January) of 1949 and ends in the last month (December) of 1960 with a frequency of 12 (months).

The Johnson & Johnson data set begins in the first quarter of 1960 and ends in the last quarter of 1980 with a frequency of 4.

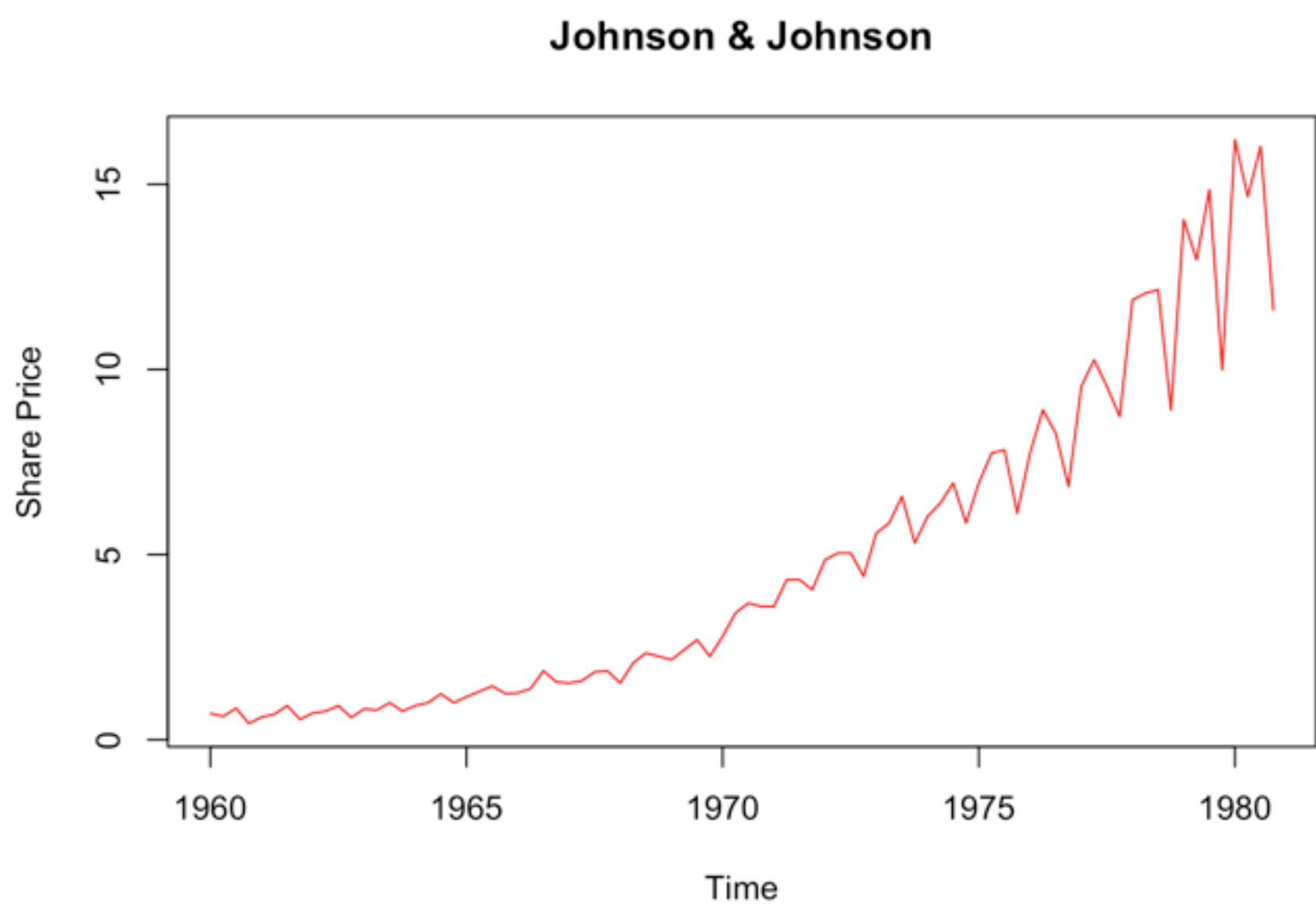
### Question 6 Part c

```
plot(AirPassengers, main = "Monthly Airline Passengers", ylab = "Passengers (Thousands)", col = "blue")
```



The Airline Passengers plot shows a clear upward trend over time. Also we can see that there is seasonality somewhere around the middle of the year.

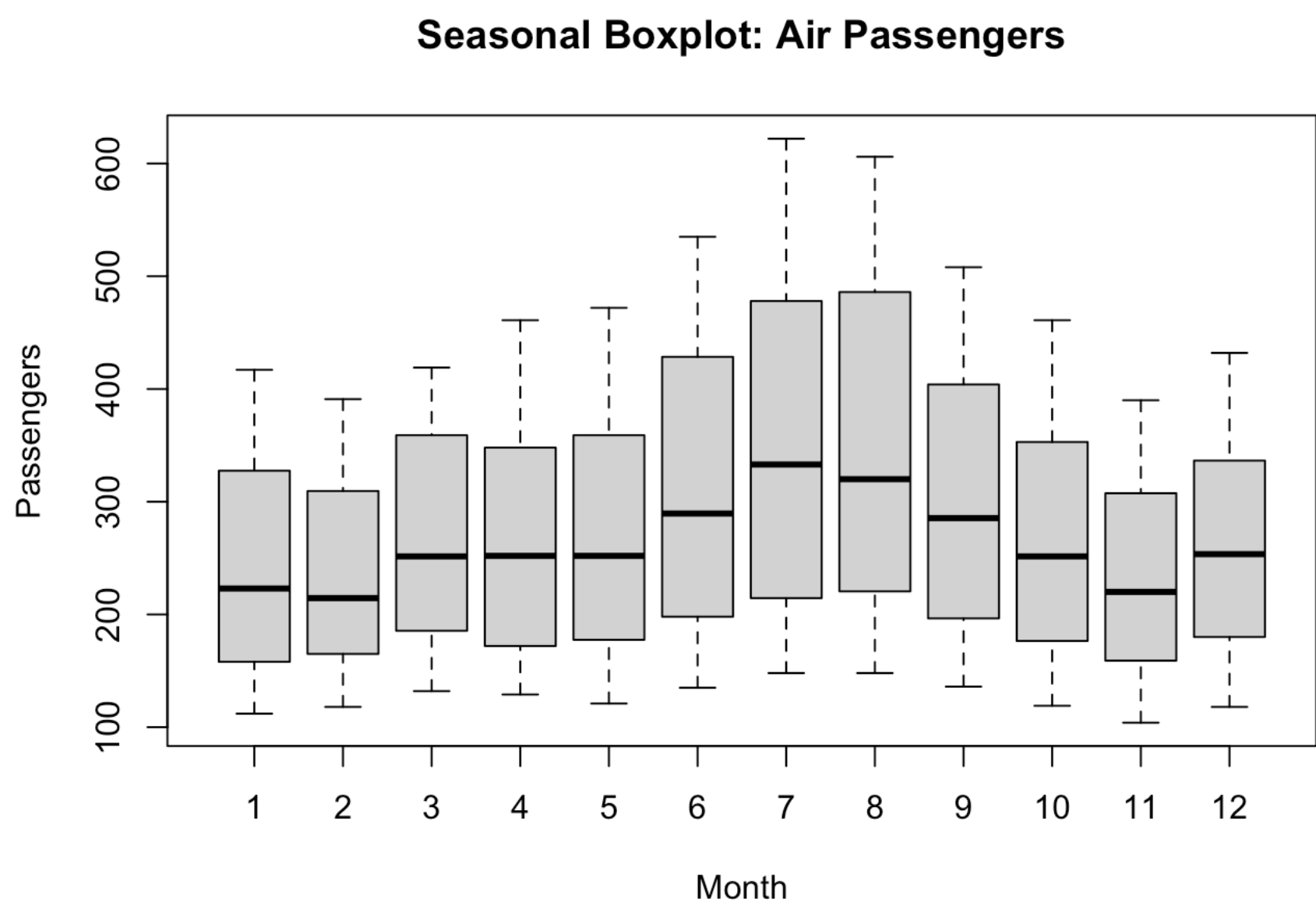
```
plot(JohnsonJohnson, main = "Johnson & Johnson", ylab = "Share Price", col = "red")
```



In the Johnson & Johnson plot we again see the upwards trend over time. This time however, we don't see nearly as strong seasonality although there are signs that it could be there.

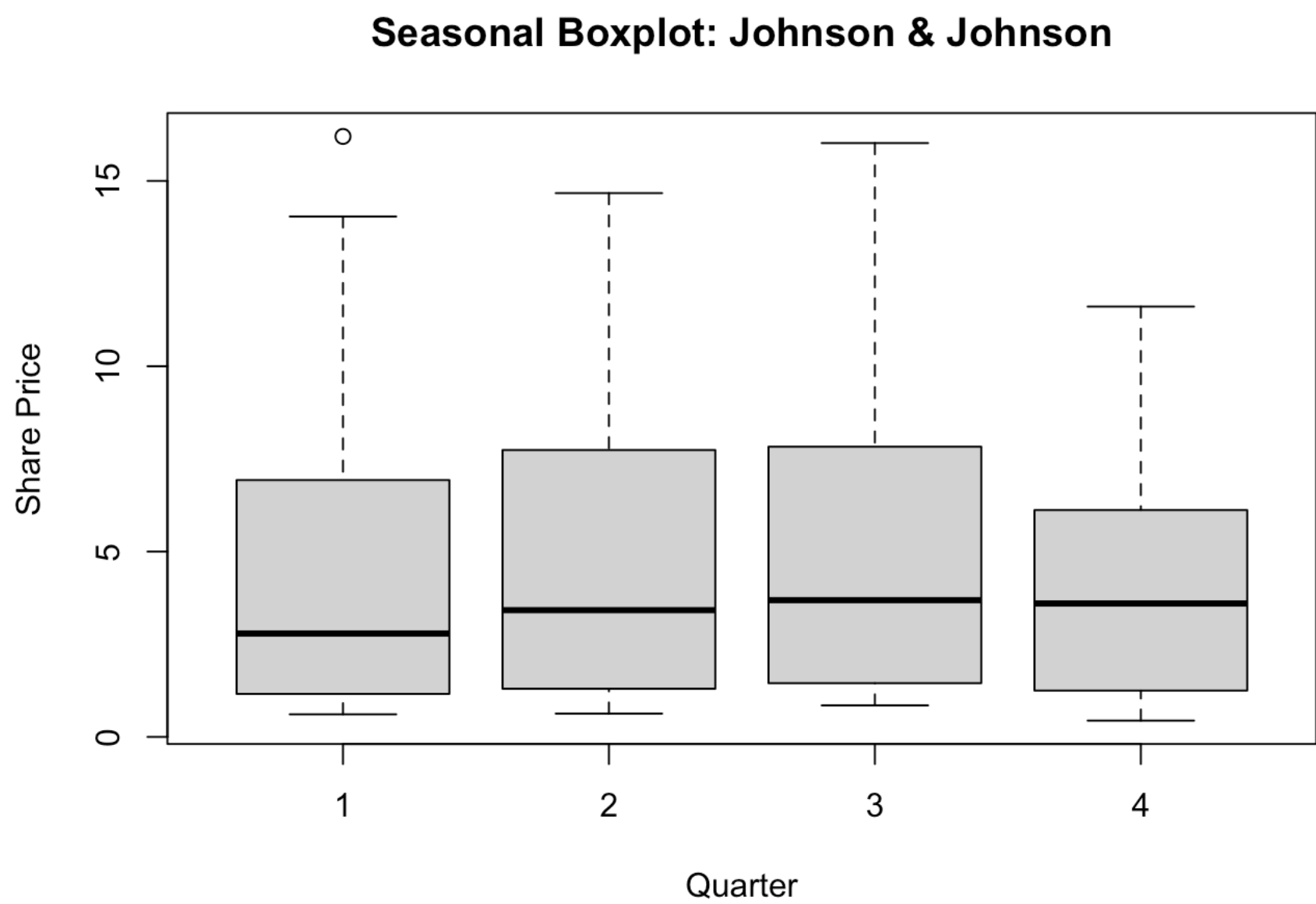
### Question 6 Part d

```
boxplot(AirPassengers ~ cycle(AirPassengers), main = "Seasonal Boxplot: Air Passengers", xlab = "Month", ylab = "Passengers")
```



The seasonal box plot of Air Passengers shows us that it is indeed seasonal. We see that in months 6-9 (June-September) the average number of passengers is higher than the other months.

```
boxplot(JohnsonJohnson ~ cycle(JohnsonJohnson), main = "Seasonal Boxplot: Johnson & Johnson", xlab = "Quarter", ylab = "Share Price")
```



In the first plot of Johnson & Johnson, we thought there may be some seasonality in the share price. However, after looking at the seasonal box plot, we can see that share price doesn't have any seasonality as the average share prices are relatively similar for each quarter.