

# Lab5

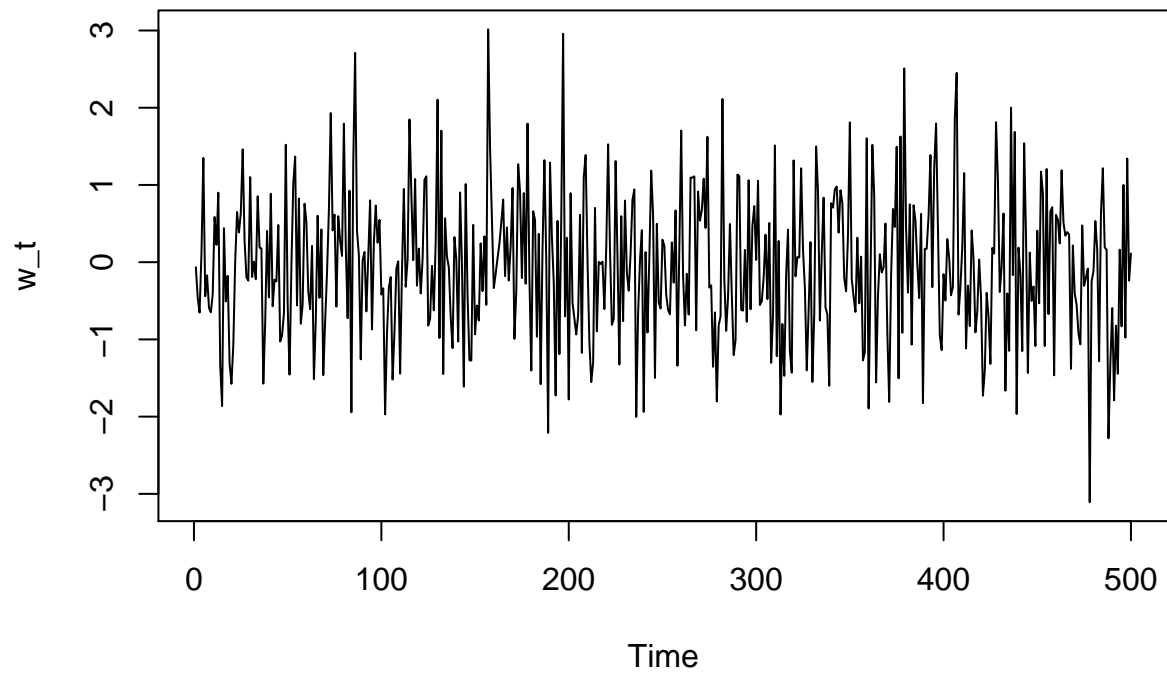
*Claudius Taylor, Tom Wilson, Junpu Zhao*

*9/26/2018*

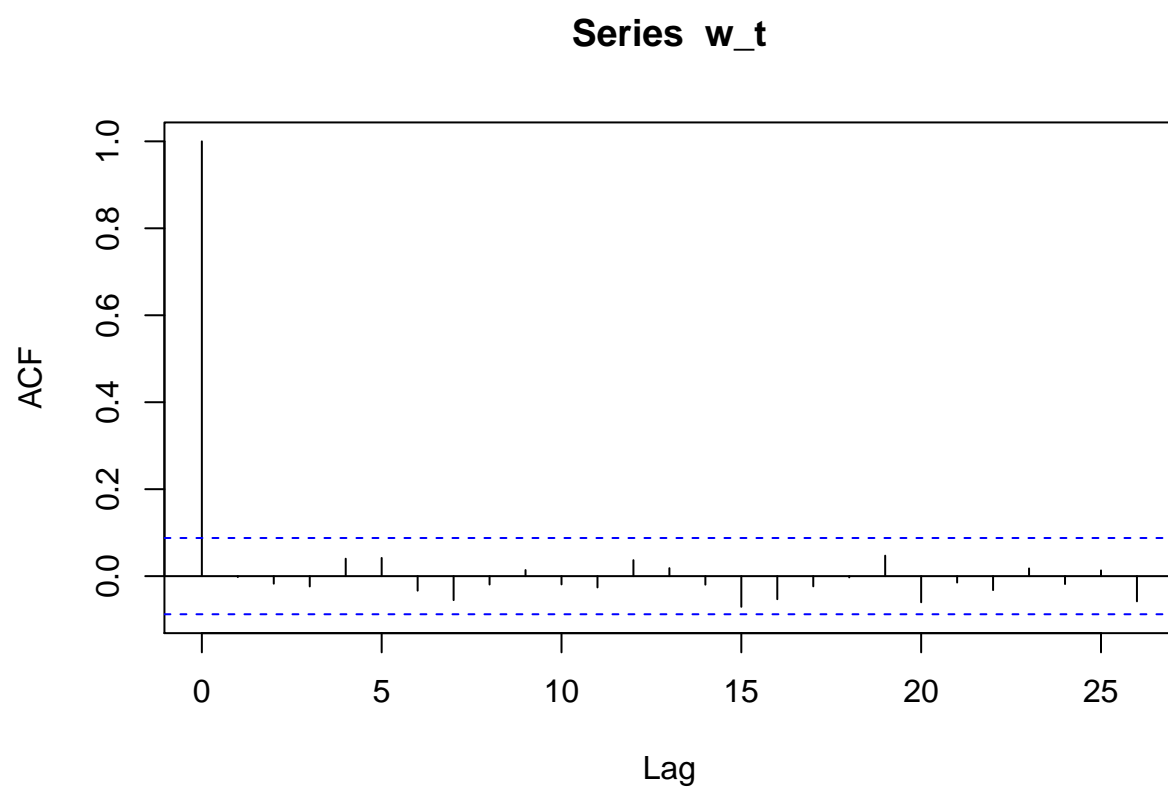
```
library(data.table)
```

Generate a simple random walk data.

```
w_t <- ts(rnorm(500,0,1))  
plot(w_t)
```

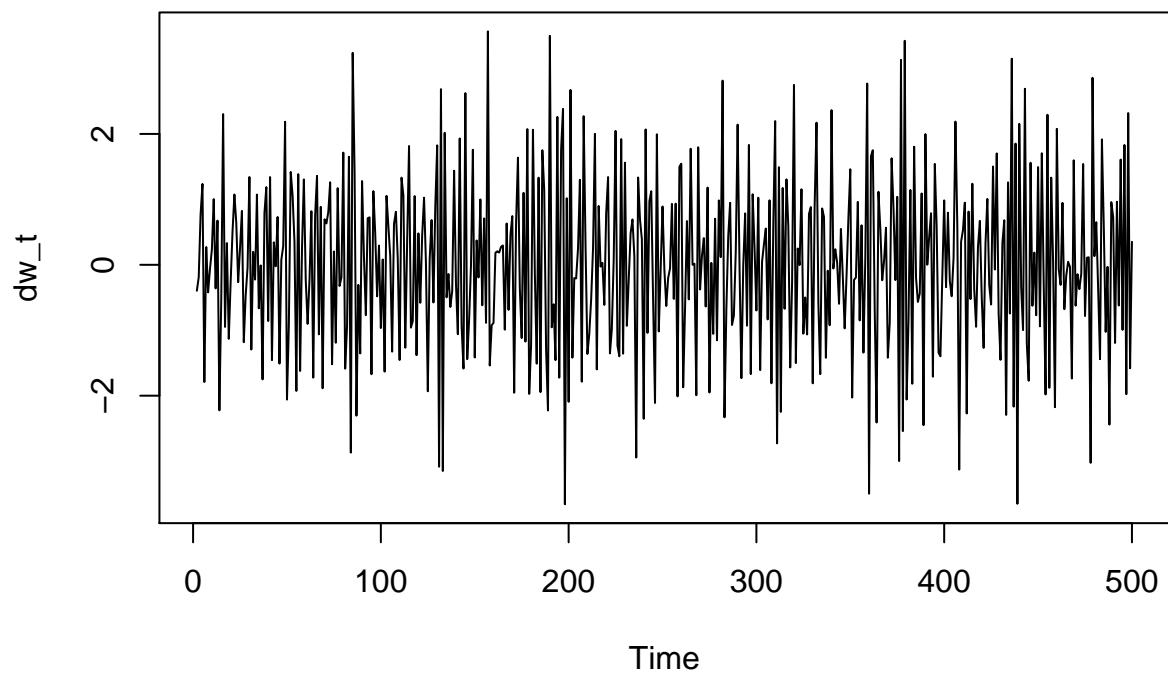


```
acf(w_t)
```

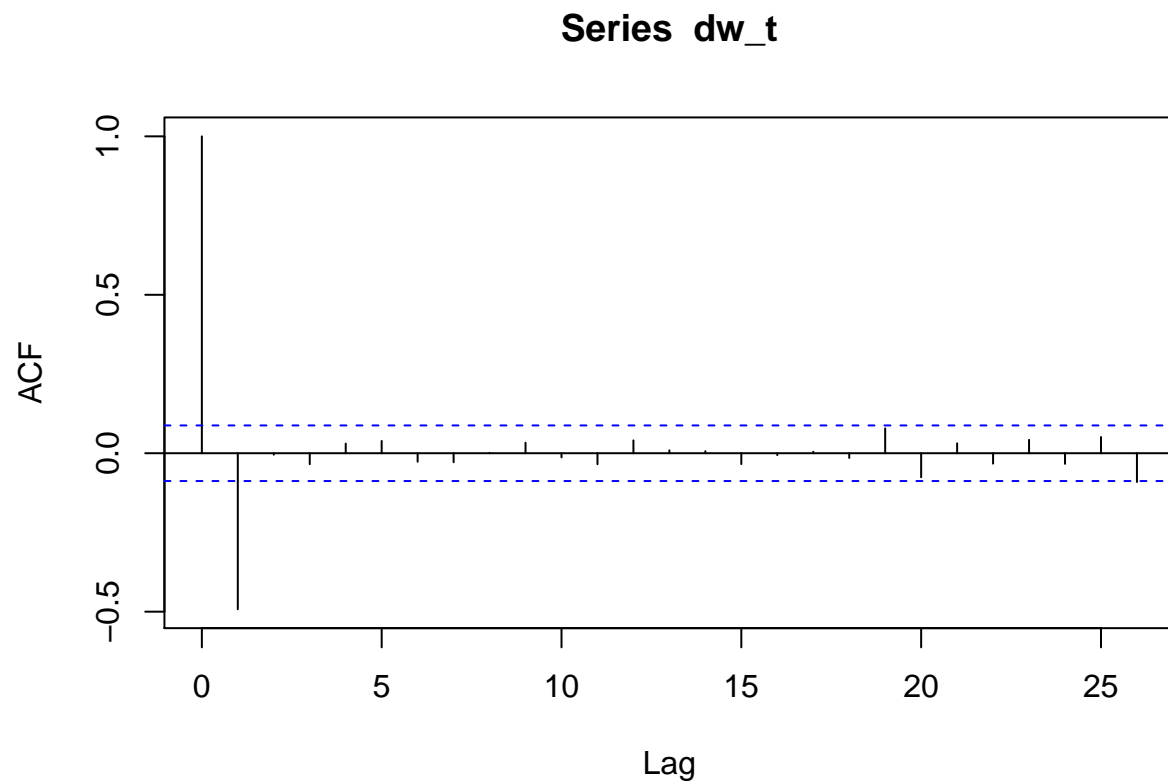


Apply first-order differencing.

```
dw_t <- diff(w_t)
plot(dw_t)
```



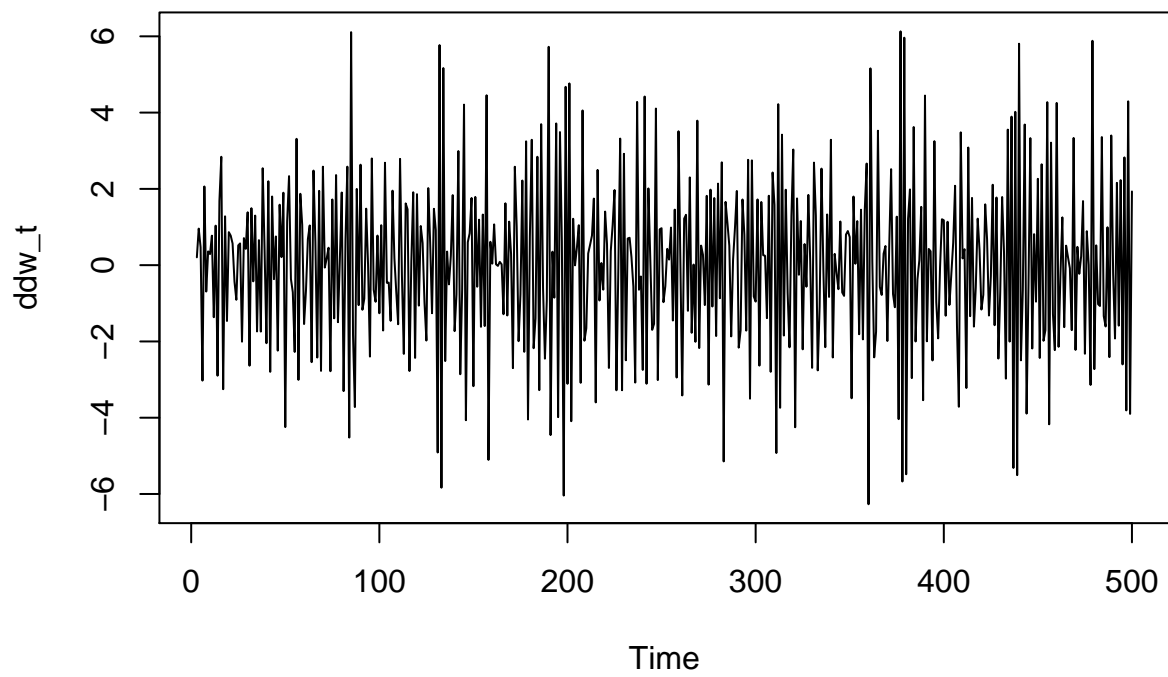
```
acf(dw_t)
```



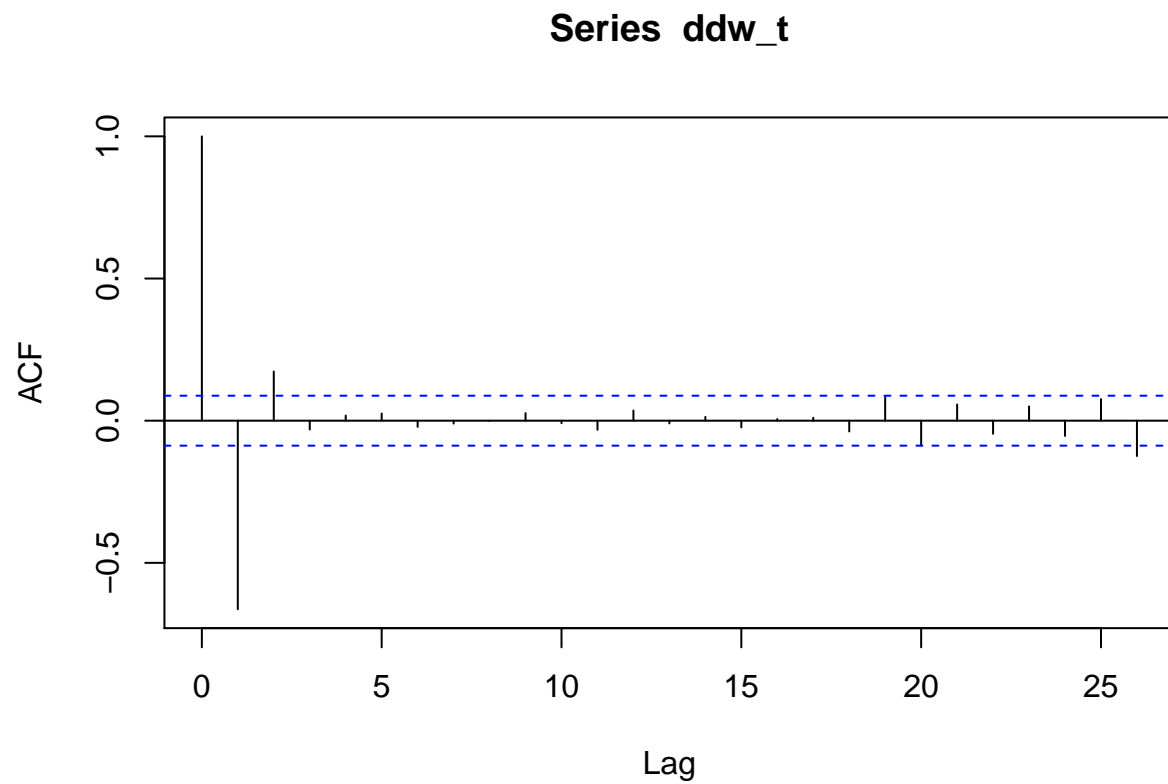
#### Did it remove non-stationarity? *no* it adds non-stationarity at lag=1.

**Apply second-order differencing.**

```
ddw_t <- diff(dw_t)
plot(ddw_t)
```



```
acf(ddw_t)
```



**Did it remove non-stationarity?**

*No it introduces non-stationarity at lag=2*

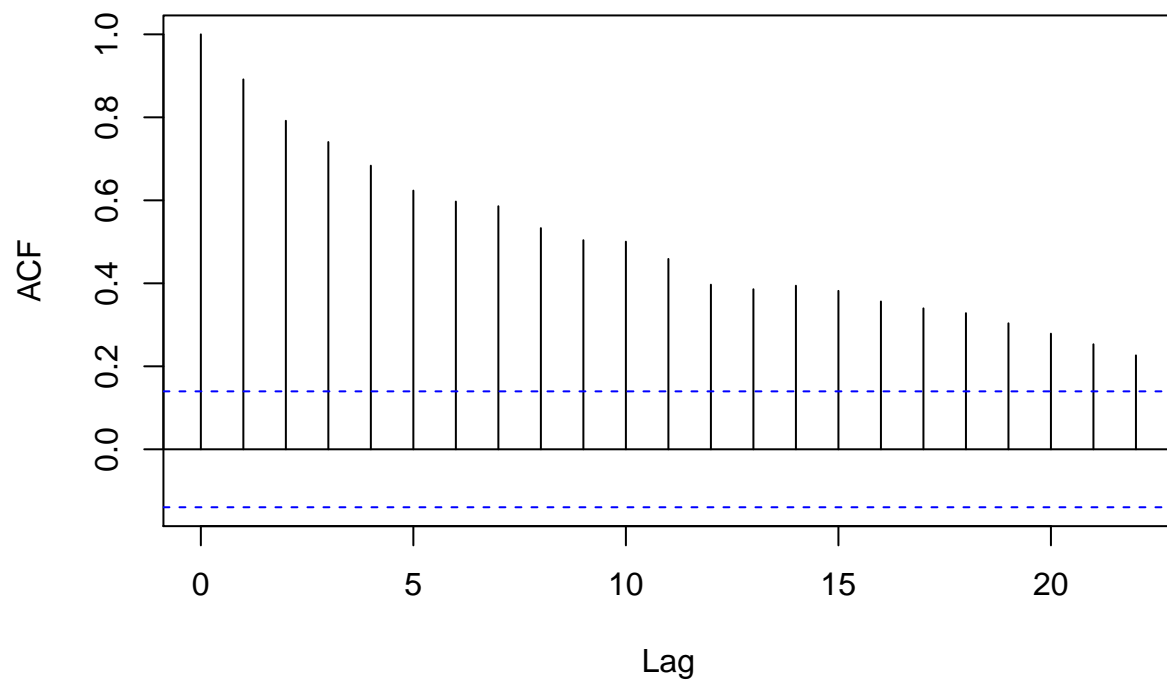
**Consider the immigration data from BB.**

```
immigration_data = fread('https://raw.githubusercontent.com/wilsonify/TimeSeries/master/data/immigration')
plot(immigration_data$yr, immigration_data$count)
```



```
acf(immigration_data$count)
```

### Series immigration\_data\$count



Stationary?

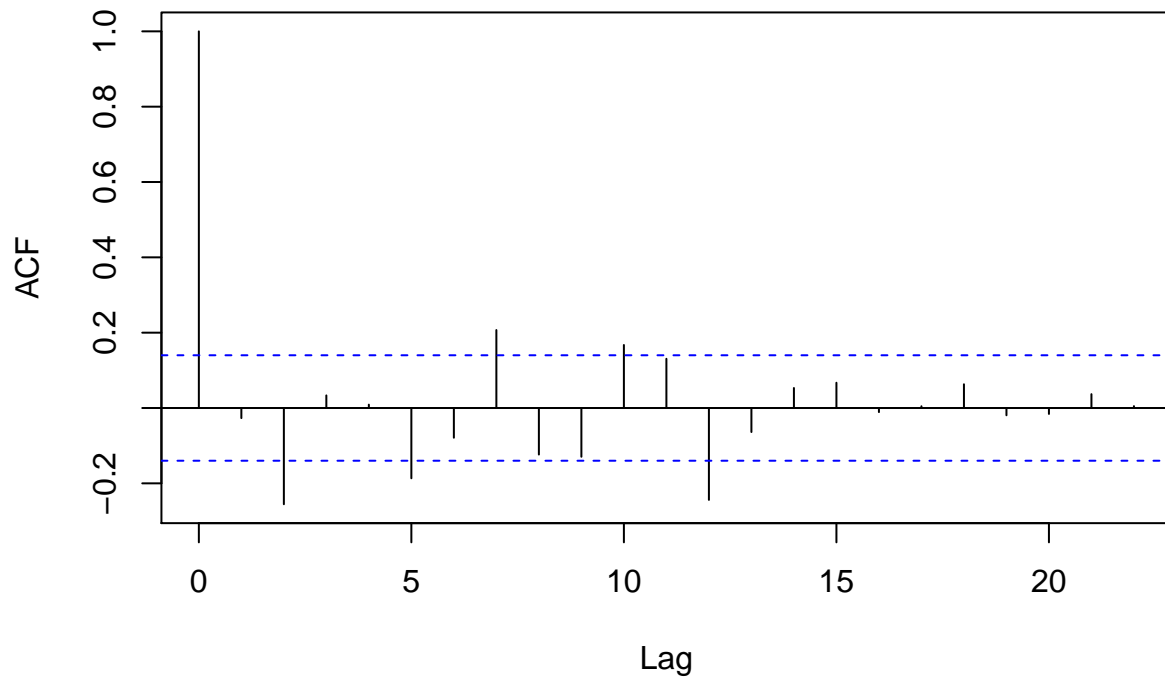
No

If not stationary then try to stationarize the data.

```
dcount <- diff(immigration_data$count)
acf(dcount)
```



## Series dcount



Consider the Monthly Australian Beer Consumption data from BB.

Decompose the data and interpret.

```
beer_data = fread('https://raw.githubusercontent.com/wilsonify/TimeSeries/master/data/monthly-beer-production-in-austr.csv')

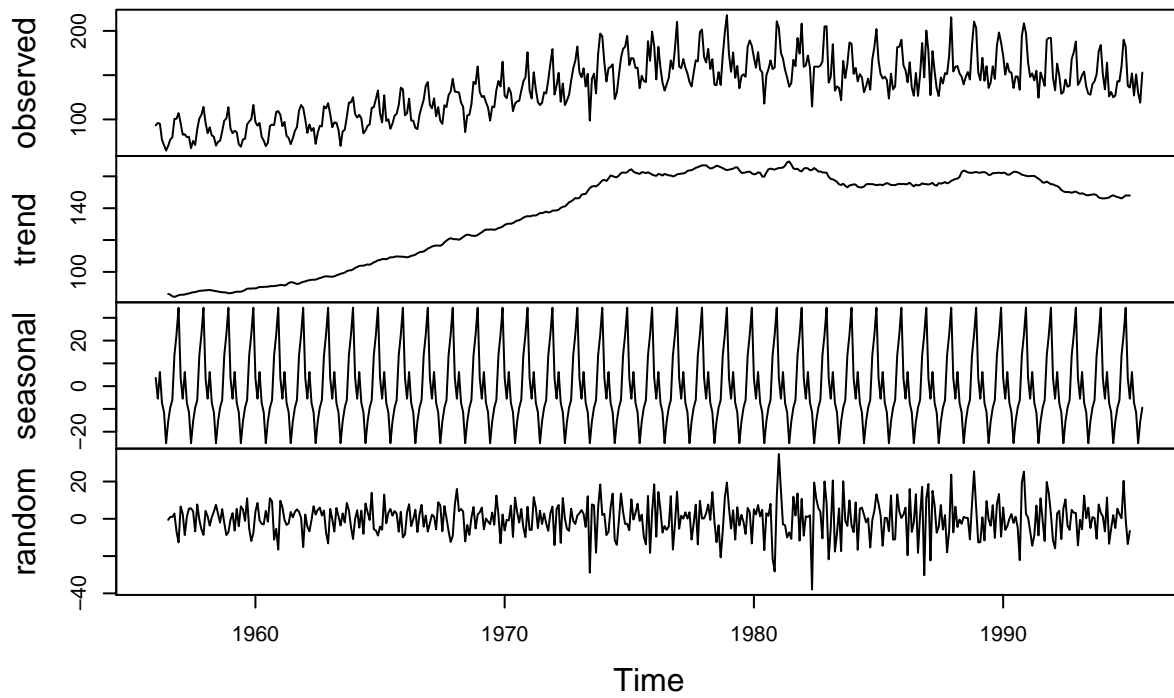
## Warning in fread("https://raw.githubusercontent.com/wilsonify/TimeSeries/
## master/data/monthly-beer-production-in-austr.csv"): Discarded single-line
## footer: <<Monthly beer production in Australia: megalitres. Includes ale
## and stout. Does not include beverages with alcohol percentage less than
## 1.15. Jan 1956 ? Aug 1995>>

colnames(beer_data) <- c('month', 'beer')

beer <- ts(beer_data$beer, start = 1956, frequency = 12)

decompose_beer <- decompose(beer, type = "additive")
plot(decompose_beer)
```

## Decomposition of additive time series



Australian beer production shows a steady increase from 1960 to 1975 plateauing at 160 megaliters per month with consistent seasonal swings.