# Lab5

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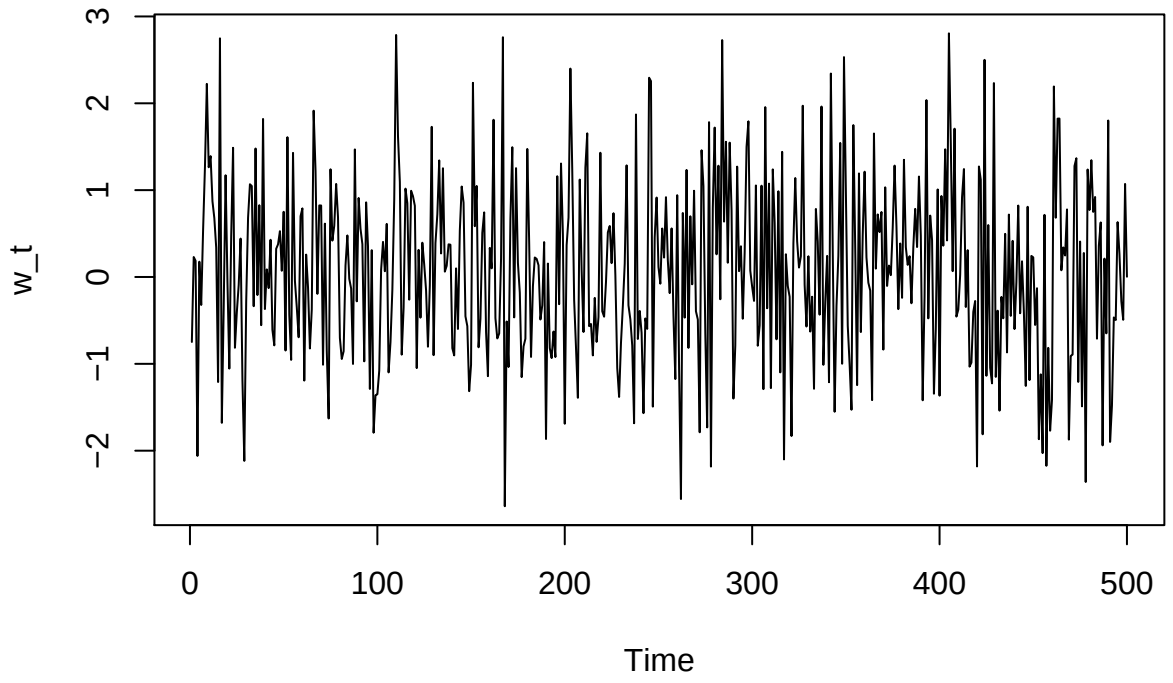
*9/26/2018*

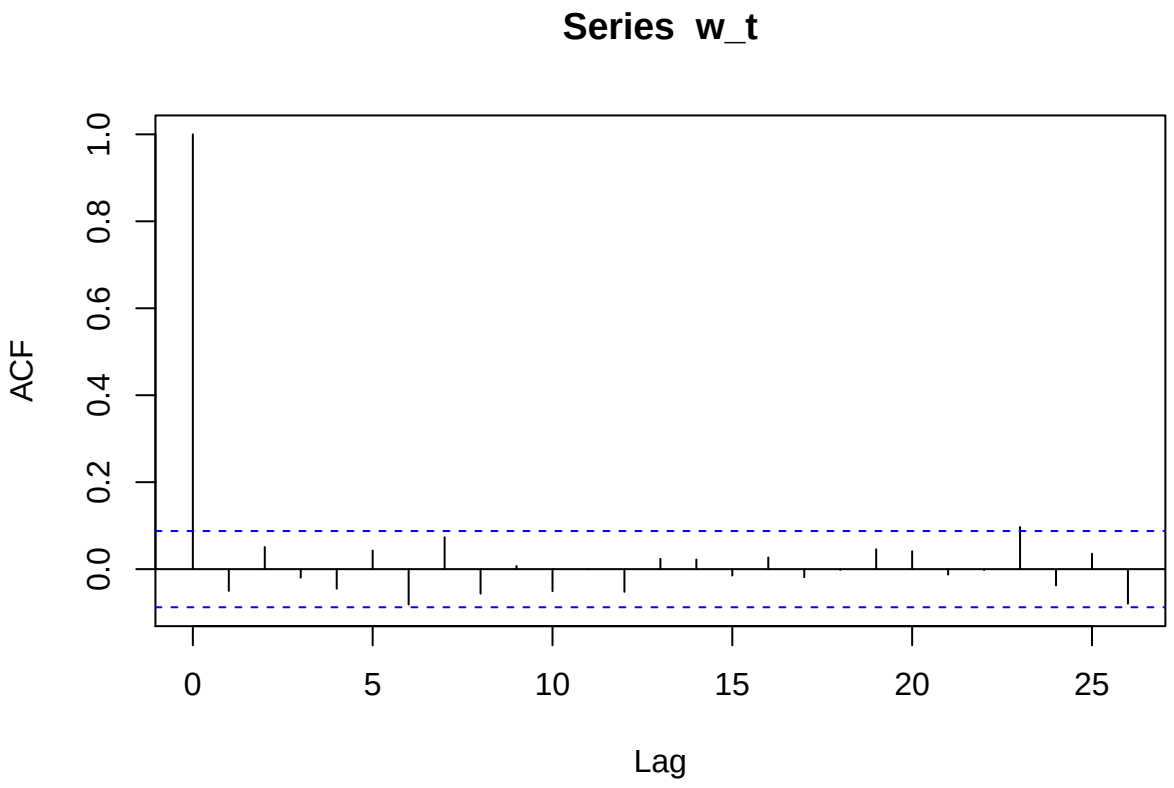
```
library(data.table)
```

### Generate a simple random walk data.

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

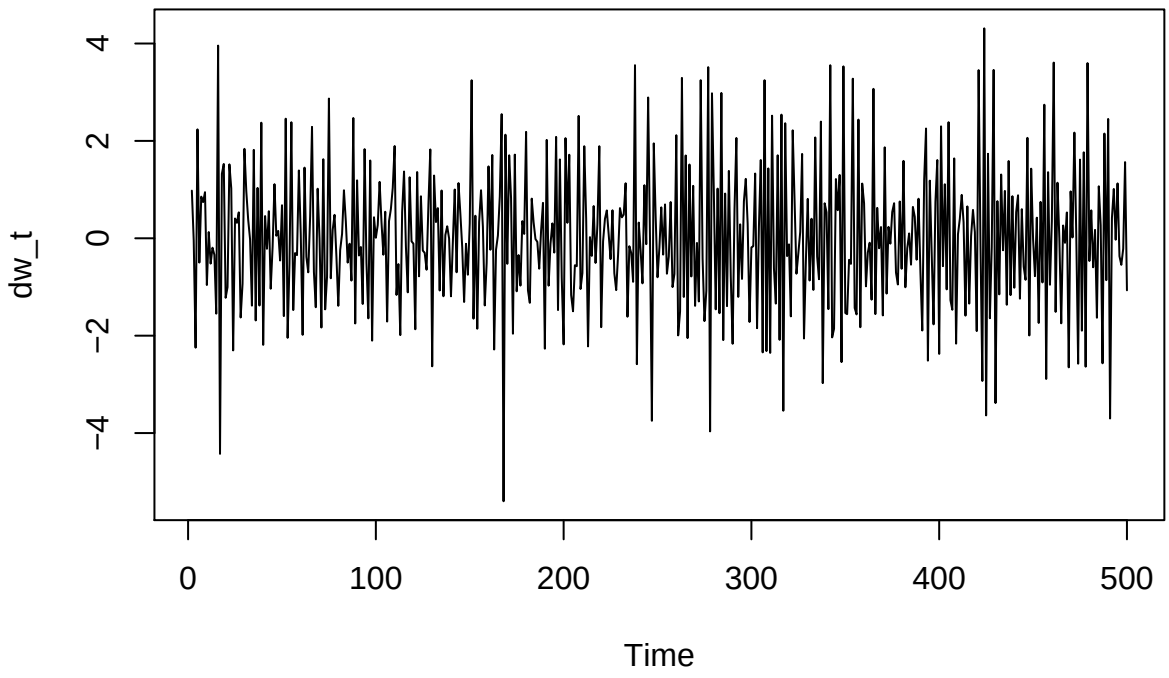



```
acf(w_t)
```

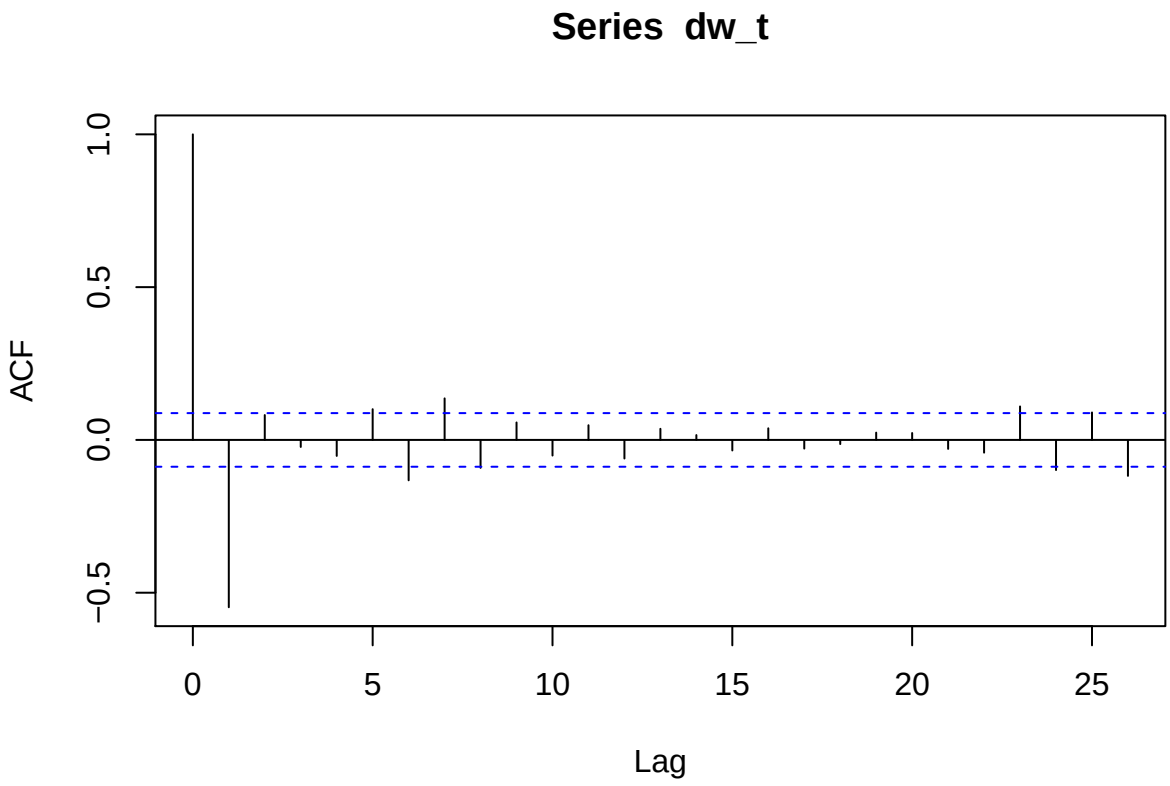



**Apply first-order differencing.**

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



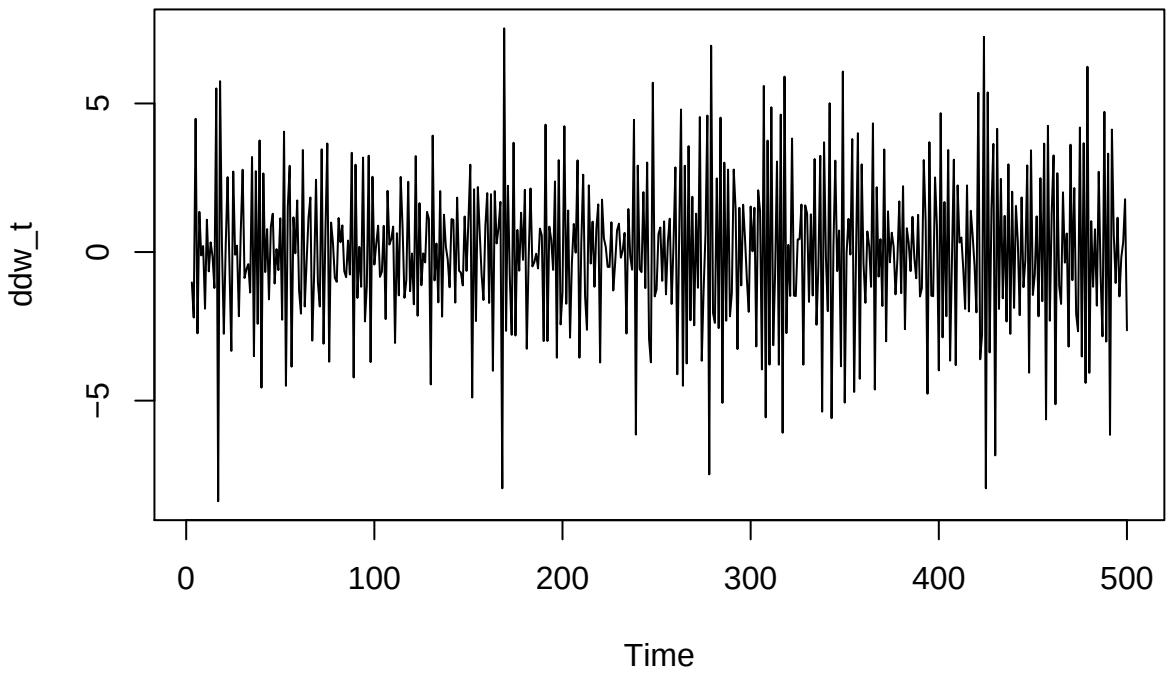

```
acf(dw_t)
```



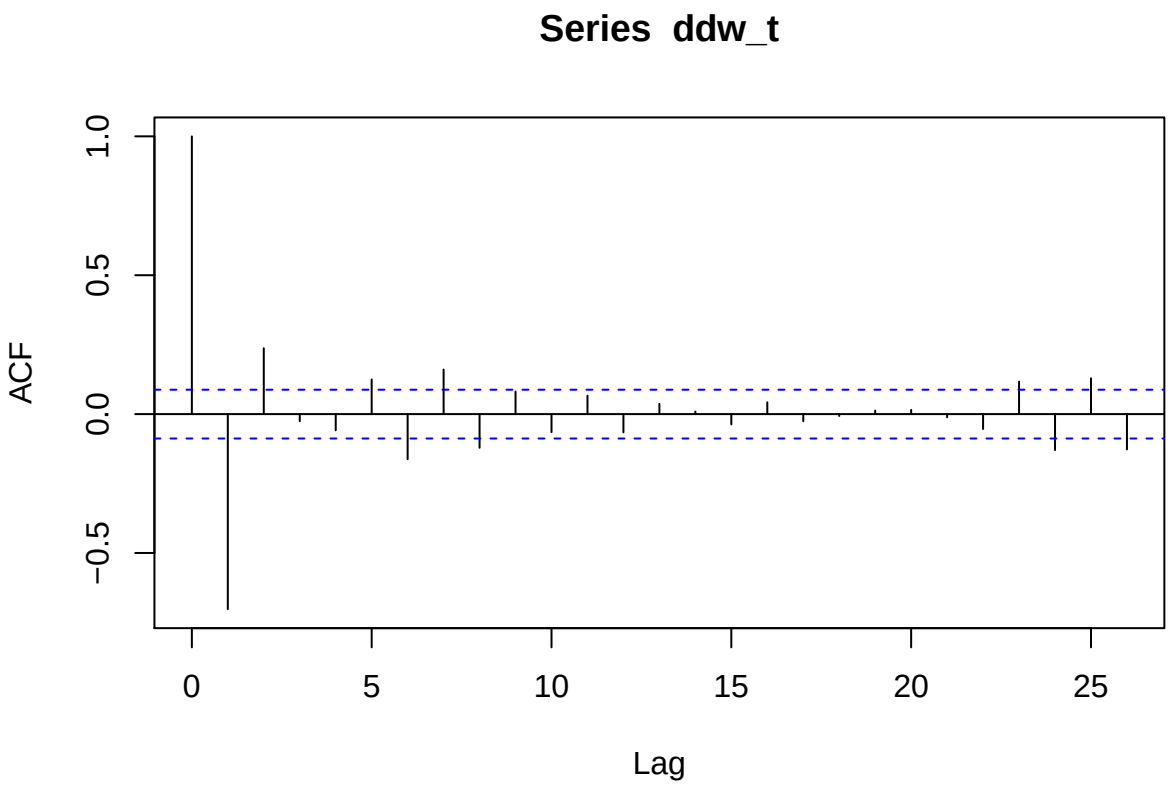

#### Did it remove non-stationarity? *no* it adds non-stationartiy at lag=1.

**Apply second-order differencing.**

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




```
acf(ddw_t)
```



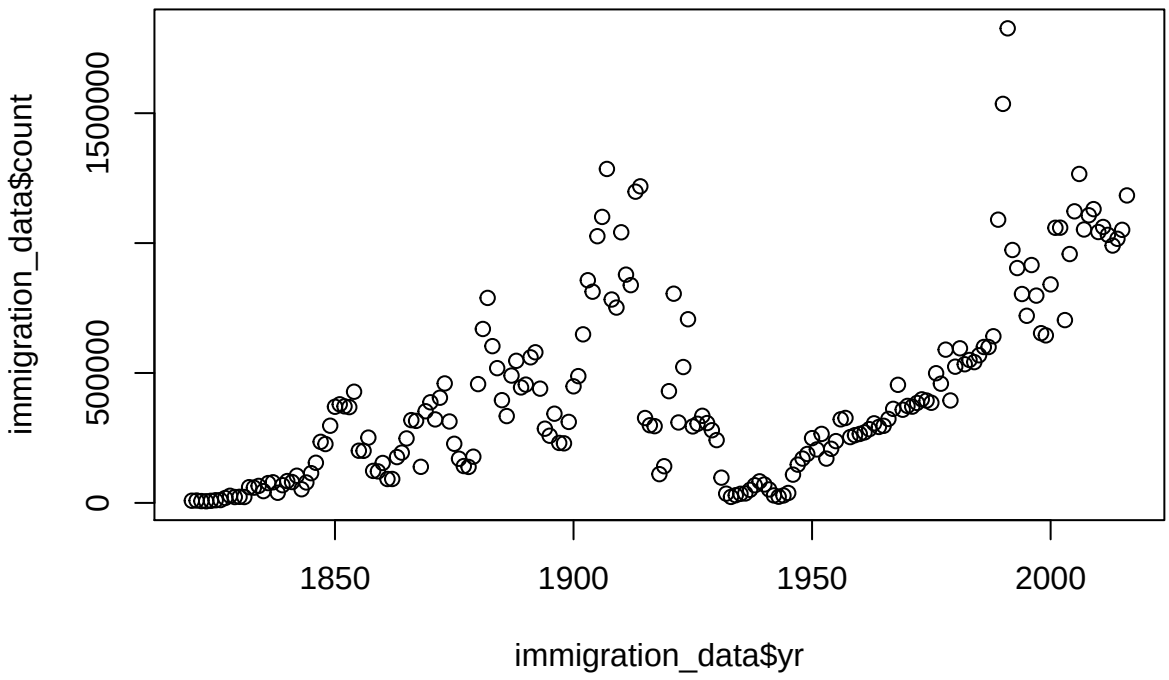

**Did it remove non-stationarity?**

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

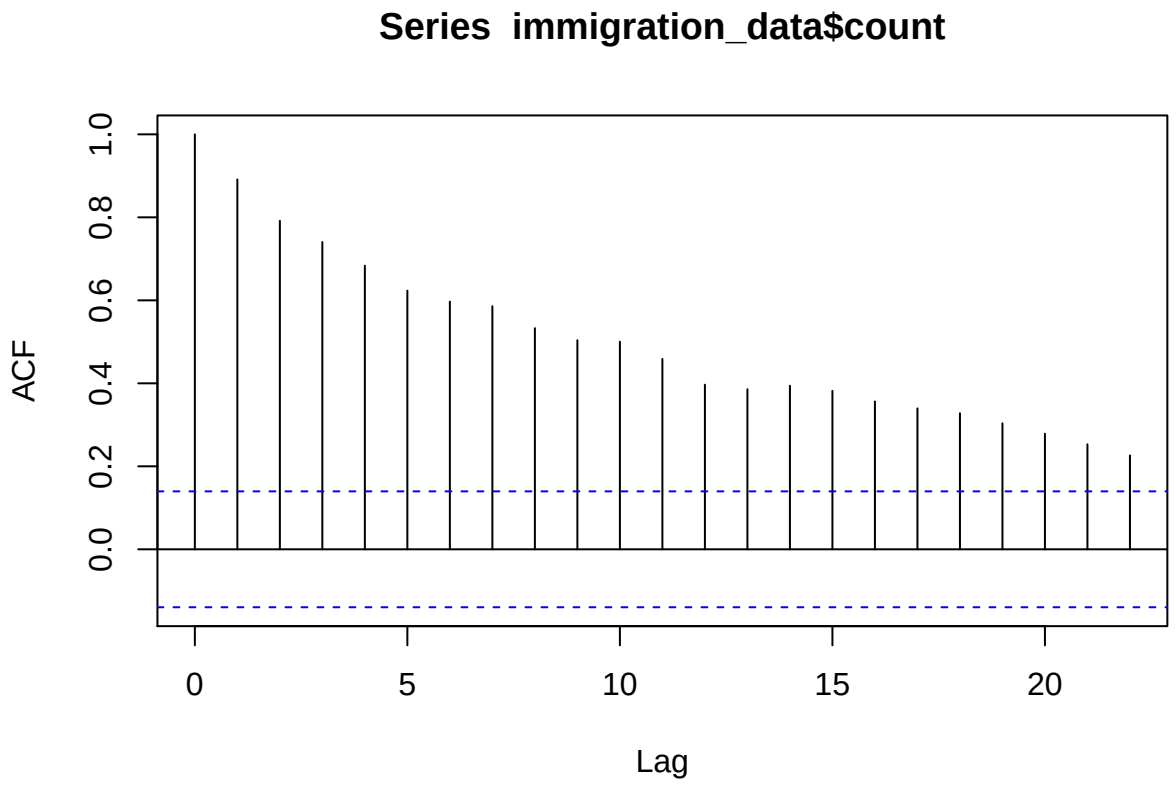
### Consider the immigration data from BB.

```
immigration_data = fread('https://raw.githubusercontent.com/wilsonify/TimeSeries/master/data/immigratio
```

```
plot(immigration_data$yr,immigration_data$count)
```




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

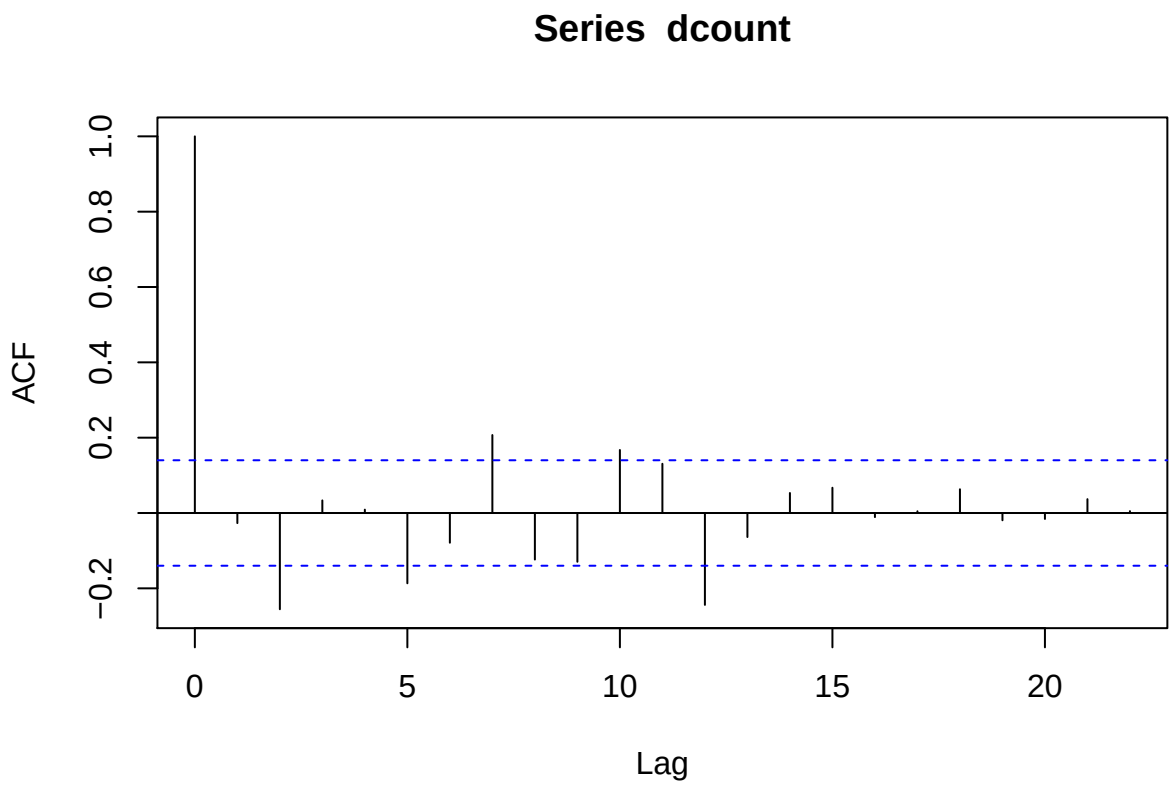



**Stationary?**

No

**If not stationary then try to stationarize the data.**

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




Consider the Monthly Australian Beer Consumption data from BB.

Decompose the data and interpret.

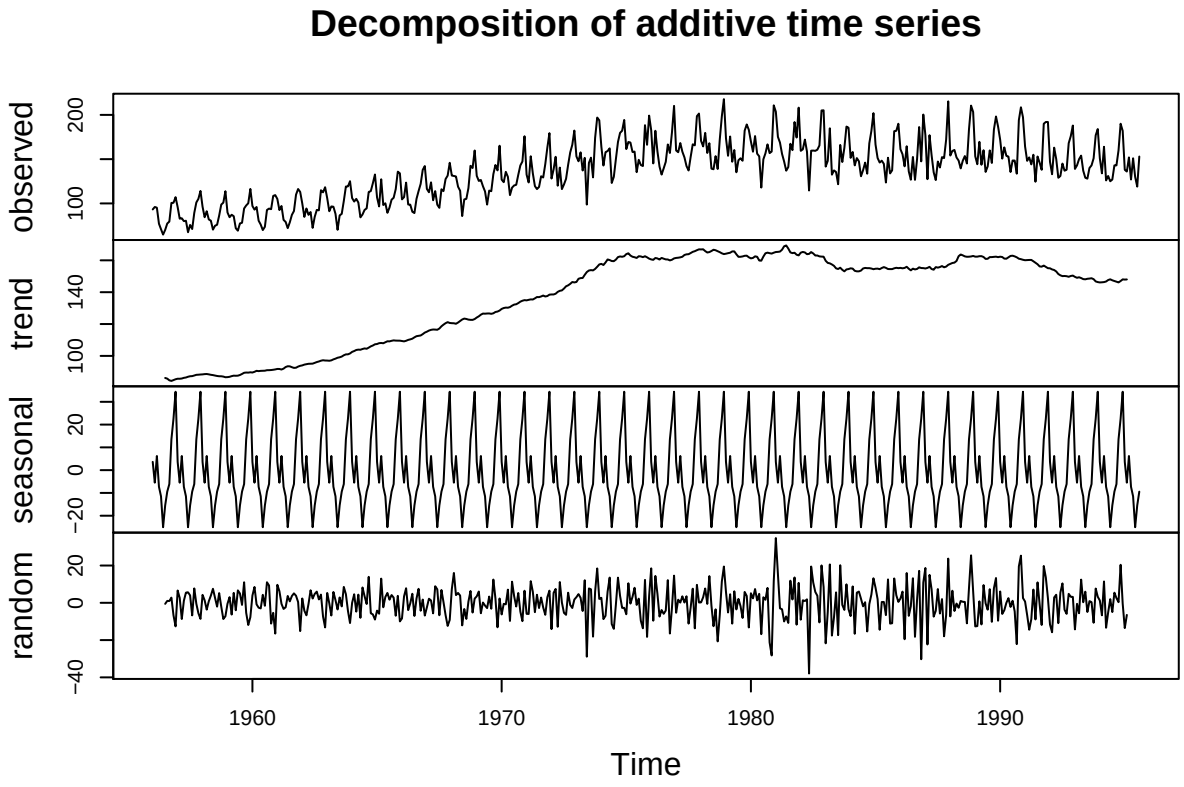
```
beer_data = fread('https://raw.githubusercontent.com/wilsonify/TimeSeries/master/data/monthly-beer-produ
```

```
## 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)
```




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