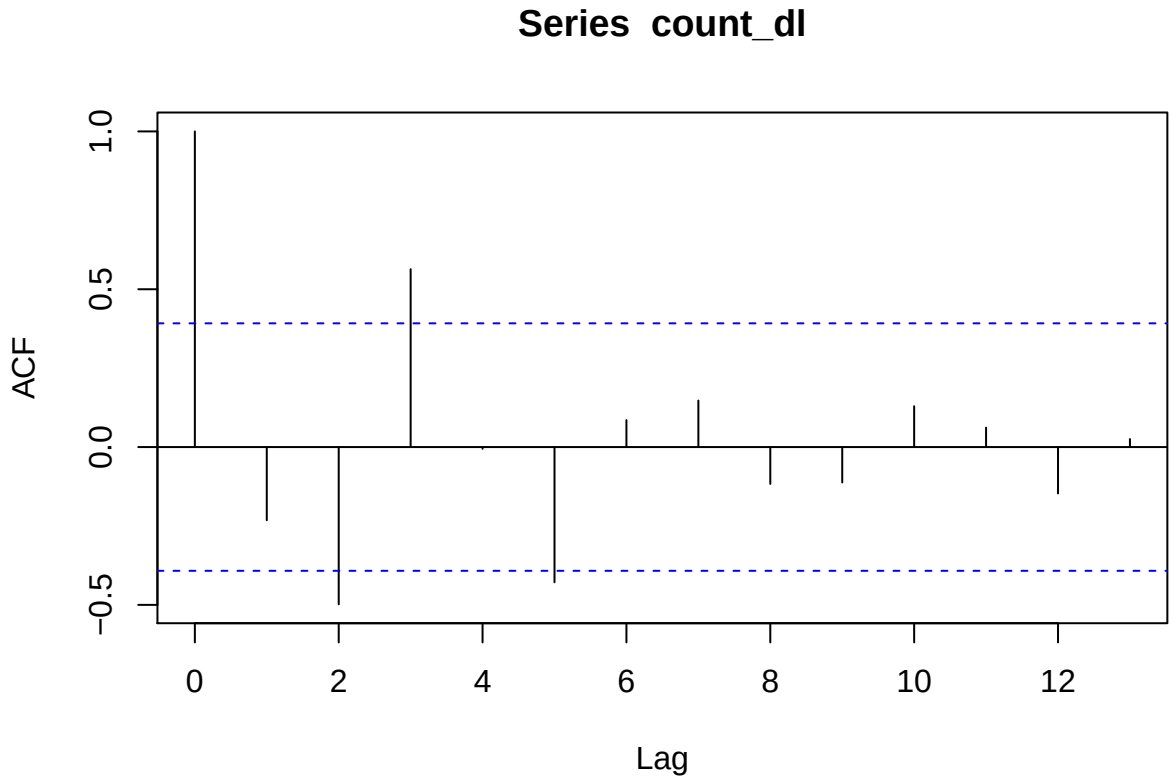
Mann-Kendall test

Kai Yang

Test annual PFE (AVHRR Data)

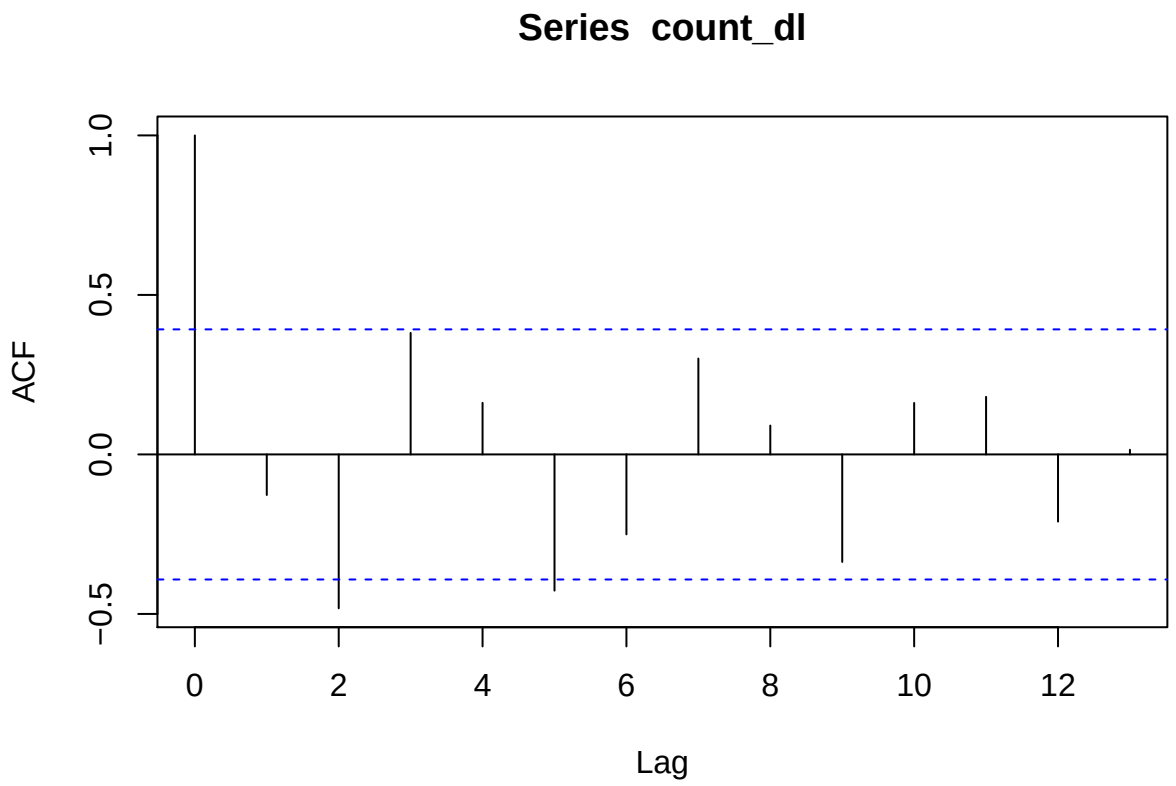
```
d <- read.csv('AVHannual.csv',header=TRUE)
d0 <- d$annual0 # South East Australia - Cayula and cornillon method
dse<- d$annualSE # South East Australia - Adaptive Canny method
dsw<- d$annualSW # South West Australia - Adaptive Canny method

count=ts(d0[1:26])
count_dl = diff(count,differences = 1)
acf <- acf(count_dl)
```




```
mmky1lag(d0)
```

```
## Corrected Zc  new P-value         N/N*   Original Z  old P.value
## 1.733882e+00 8.293910e-02 2.565586e+00 2.777235e+00 5.482346e-03
##          Tau  Sen's slope old.variance new.variance
## 3.907692e-01 1.064762e-04 2.058333e+03 5.280831e+03
```

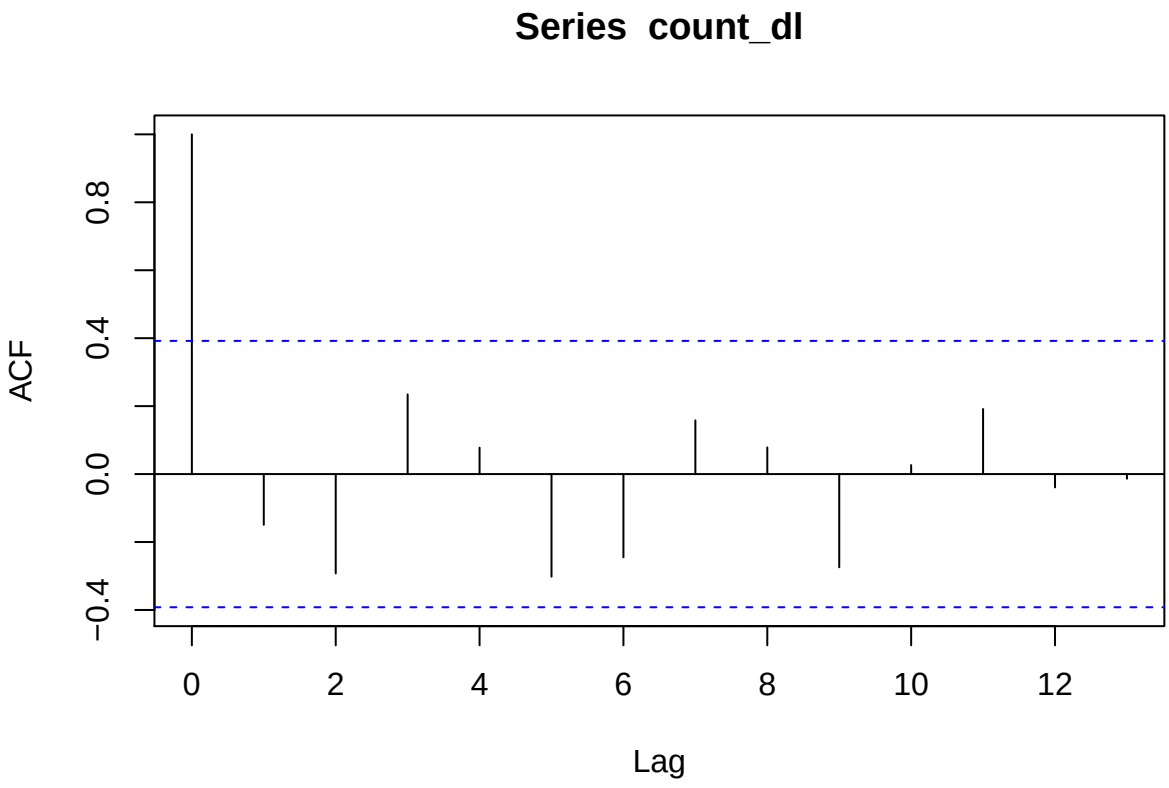
```
count=ts(dse[1:26])
count_dl = diff(count,differences = 1)
acf <- acf(count_dl)
```




```
mmky1lag(dse)
```

```
## Corrected Zc  new P-value         N/N*   Original Z  old P.value
## 6.864179e-01 4.924496e-01 3.233577e+00 1.234327e+00 2.170811e-01
##          Tau  Sen's slope old.variance new.variance
## 1.753846e-01 2.764858e-04 2.058333e+03 6.655779e+03
```

```
count=ts(dsw[1:26])
count_dl = diff(count,differences = 1)
acf <- acf(count_dl)
```



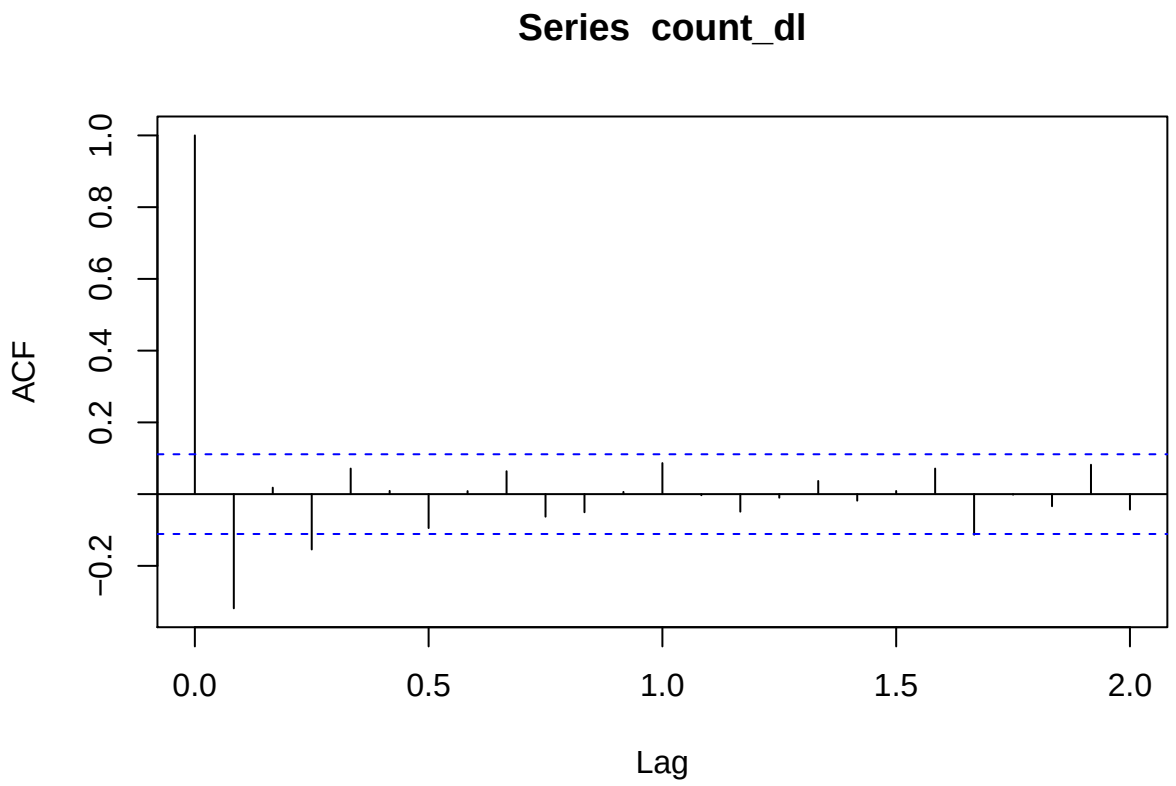

```
mmky1lag(dsw)
```

```
## Corrected Zc  new P-value         N/N*   Original Z  old P.value
## 4.419368e-01 6.585350e-01 3.223807e+00 7.934958e-01 4.274890e-01
##          Tau  Sen's slope old.variance new.variance
## 1.138462e-01 1.521890e-04 2.058333e+03 6.635669e+03
```

Test monthly PFE (AVHRR Data)

```
d <- read.csv('AVHmonth.csv',header=TRUE)
dse<- d$monthSE # South East Australia - Adaptive Canny method
dsw<- d$monthSW # South West Australia - Adaptive Canny method

# fill 'nan' PFE
avg <- mean(na.omit(dse))
dse[is.na(dse)] <- avg
avg <- mean(na.omit(dsw))
dsw[is.na(dsw)] <- avg

count=ts(dse[1:312],frequency = 12)
decomp=stl(count,"periodic")
```

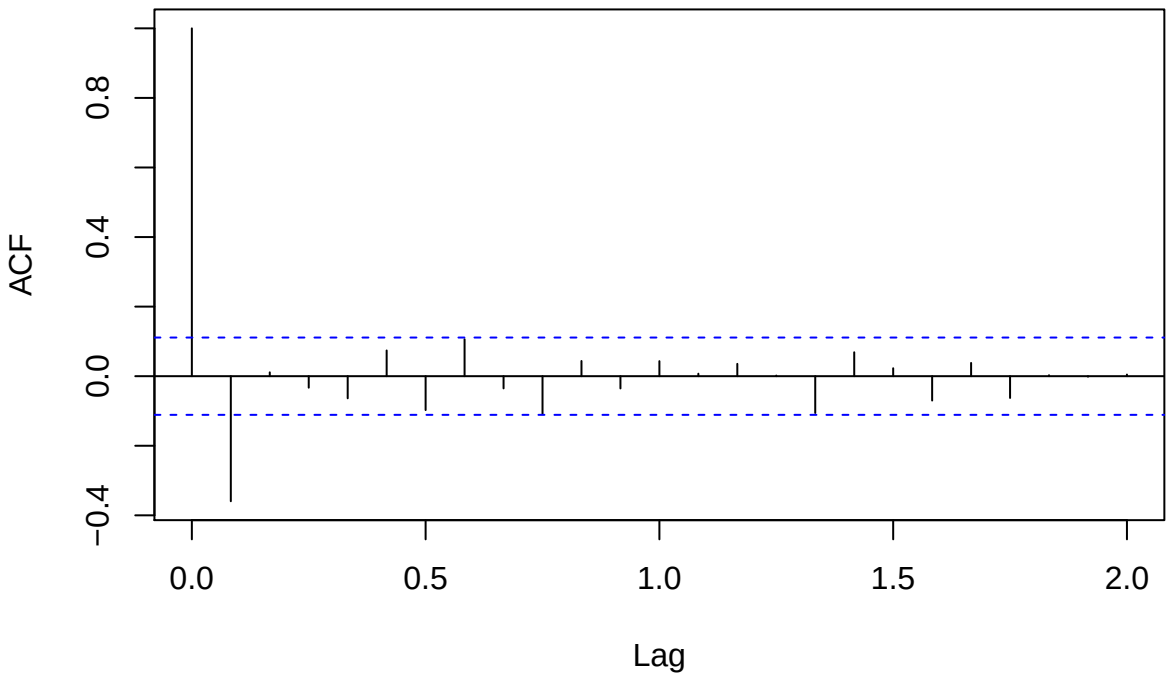
```
deseasonal_cnt <-seasadj(decomp)
count_dl = diff(deseasonal_cnt,differences = 1) # remove seasonality
acf <- acf(count_dl)
```




```
mmky1lag(dse)
```

```
## Corrected Zc  new P-value         N/N*   Original Z  old P.value
## 1.108743e+00 2.675411e-01 6.519626e+00 2.831015e+00 4.640049e-03
##          Tau  Sen's slope old.variance new.variance
## 1.074697e-01 3.858686e-05 3.390713e+06 2.210618e+07
```

```
count=ts(dsw[1:312],frequency = 12)
decomp=stl(count,"periodic")
deseasonal_cnt <-seasadj(decomp)
count_dl = diff(deseasonal_cnt,differences = 1)
acf <- acf(count_dl)
```



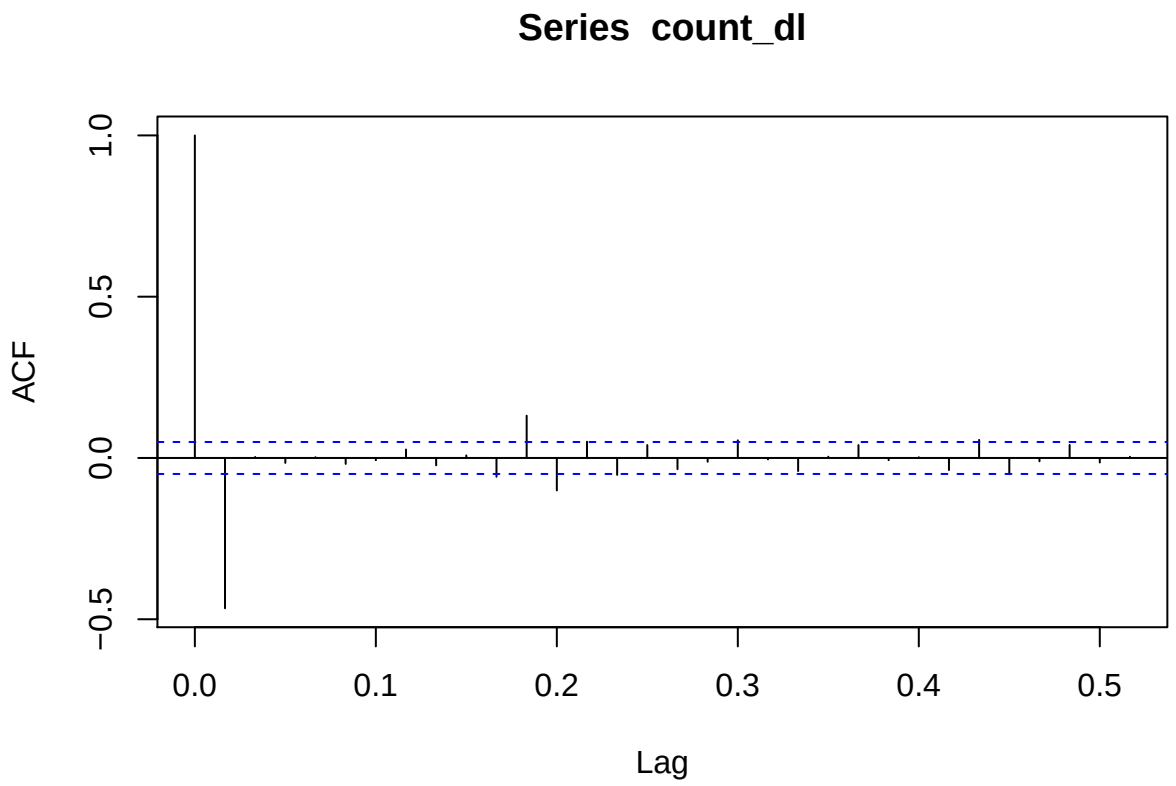

```
mmky1lag(dsw)
```

```
## Corrected Zc  new P-value         N/N*   Original Z  old P.value
## 7.263841e-01 4.676033e-01 6.416004e+00 1.839919e+00 6.578016e-02
##          Tau  Sen's slope old.variance new.variance
## 6.985324e-02 2.055092e-05 3.390701e+06 2.175475e+07
```

Test frontal density (FD) (AVHRR Data)

```
d <- read.csv('AVHfd.csv',header=TRUE)
dse<- d$fdSE # South East Australia - Adaptive Canny method
dsw<- d$fdSW # South West Australia - Adaptive Canny method

# fill 'nan' FD values
avg <- mean(na.omit(dse))
dse[is.na(dse)] <- avg
avg <- mean(na.omit(dsw))
dsw[is.na(dsw)] <- avg

count=ts(dse[1:1566],frequency = 60)
decomp=stl(count,"periodic")
```

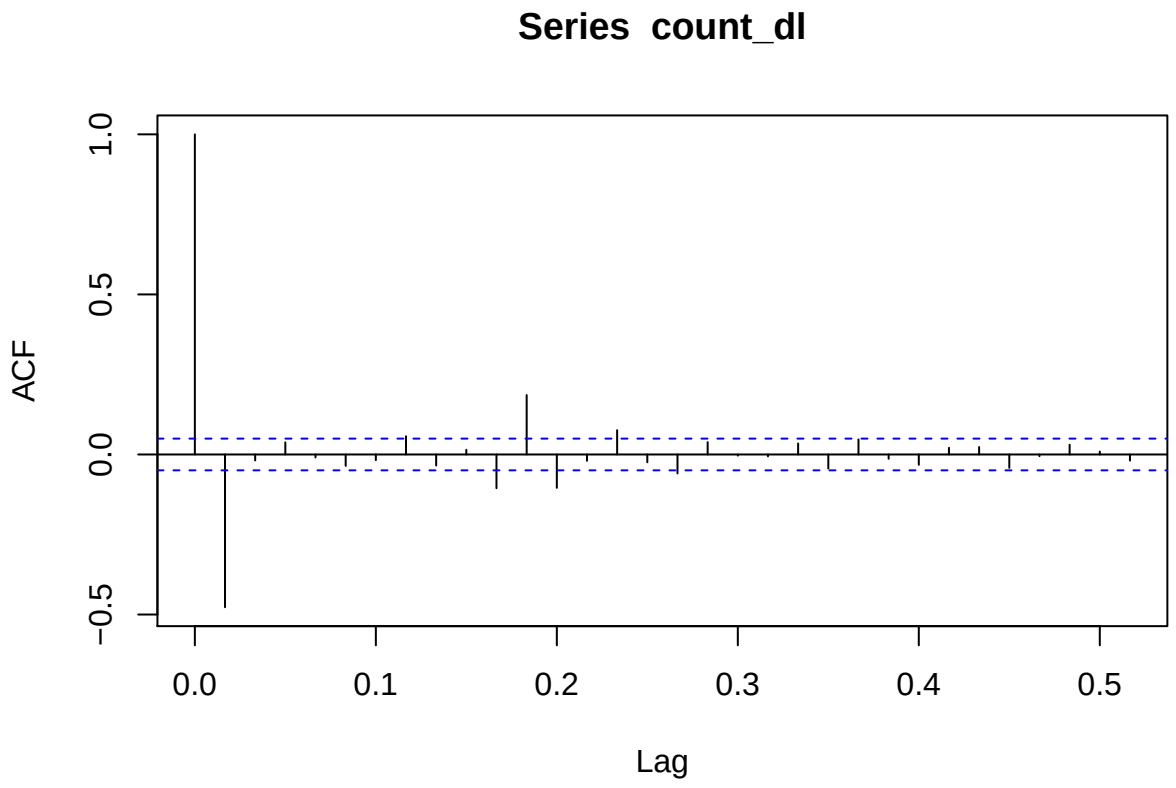
```
deseasonal_cnt <-seasadj(decomp)
count_dl = diff(deseasonal_cnt,differences = 1) # remove seasonality
acf <- acf(count_dl)
```




```
mmky1lag(dse)
```

```
## Corrected Zc  new P-value         N/N*   Original Z  old P.value
## 2.925976e+00 3.433778e-03 3.404633e+00 5.398907e+00 6.704810e-08
##          Tau  Sen's slope old.variance new.variance
## 9.105554e-02 4.194949e-06 4.271156e+08 1.454172e+09
```

```
count=ts(dsw[1:1566],frequency = 60)
decomp=stl(count,"periodic")
deseasonal_cnt <-seasadj(decomp)
count_dl = diff(deseasonal_cnt,differences = 1)
acf <- acf(count_dl)
```

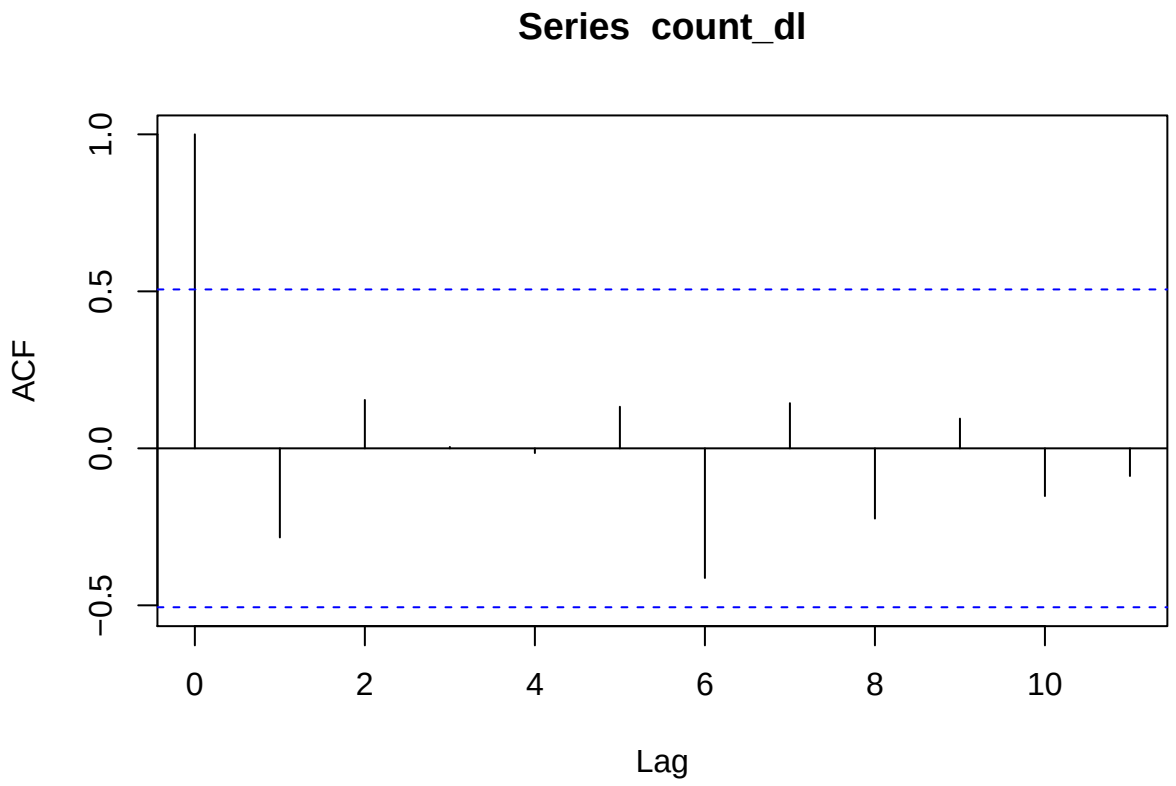



```
mmky1lag(dsw)
```

```
## Corrected Zc  new P-value         N/N*   Original Z  old P.value
## 2.170516e+00 2.996774e-02 2.976292e+00 3.744561e+00 1.807096e-04
##          Tau  Sen's slope old.variance new.variance
## 6.315433e-02 3.357437e-06 4.271156e+08 1.271221e+09
```

Test annual PFE (MODIS Data)

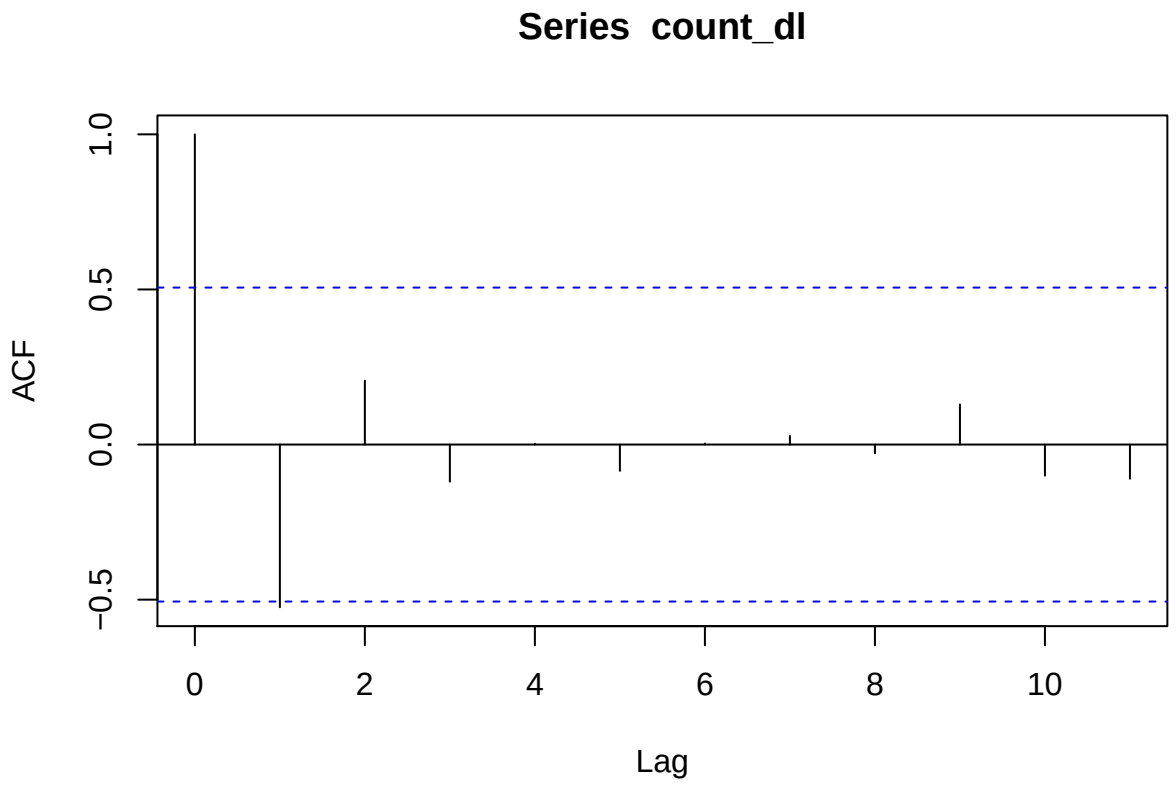
```
d <- read.csv('MODannual.csv',header=TRUE)
dse<- d$annualSE # South East Australia - Adaptive Canny method
dsw<- d$annualSW # South West Australia - Adaptive Canny method

count=ts(dse[1:16])
count_dl = diff(count,differences = 1)
acf <- acf(count_dl)
```




```
mmky1lag(dse)
```

```
## Corrected Zc  new P-value         N/N*   Original Z  old P.value
## 4.752247e-01 6.346268e-01 2.593936e+00 7.653828e-01 4.440436e-01
##          Tau  Sen's slope old.variance new.variance
## 1.500000e-01 3.300228e-04 4.933333e+02 1.279675e+03
```

```
count=ts(dsw[1:16])
count_dl = diff(count,differences = 1)
acf <- acf(count_dl)
```



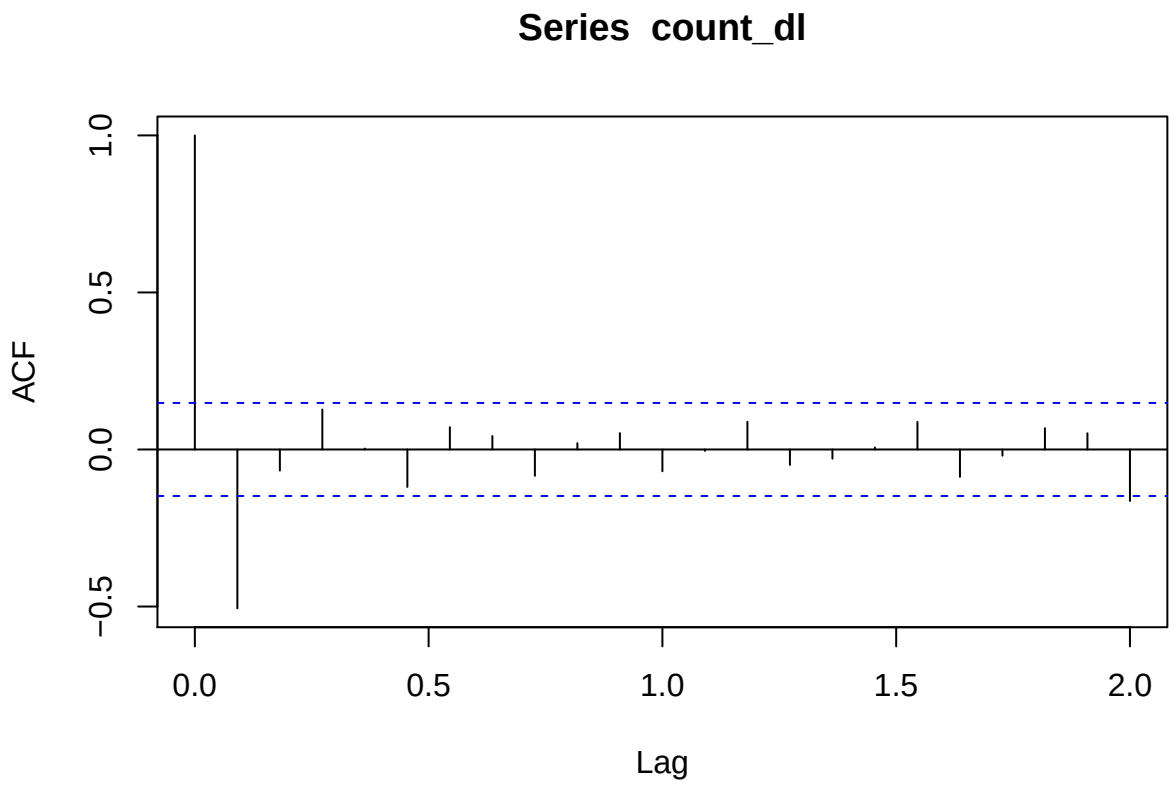

```
mmky1lag(dsw)
```

```
## Corrected Zc  new P-value         N/N*   Original Z  old P.value
## 2.627952e+00 8.590062e-03 5.943602e-01 2.026013e+00 4.276343e-02
##          Tau  Sen's slope old.variance new.variance
## 3.833333e-01 4.793806e-04 4.933333e+02 2.932177e+02
```

Test monthly PFE (MODIS Data)

```
d <- read.csv('MODmonth.csv',header=TRUE)
dse<- d$monthSE # South East Australia - Adaptive Canny method
dsw<- d$monthSW # South West Australia - Adaptive Canny method

# fill 'nan' PFE values
avg <- mean(na.omit(dse))
dse[is.na(dse)] <- avg
avg <- mean(na.omit(dsw))
dsw[is.na(dsw)] <- avg

count=ts(dse[1:176],frequency = 11)
decomp=stl(count,"periodic")
```

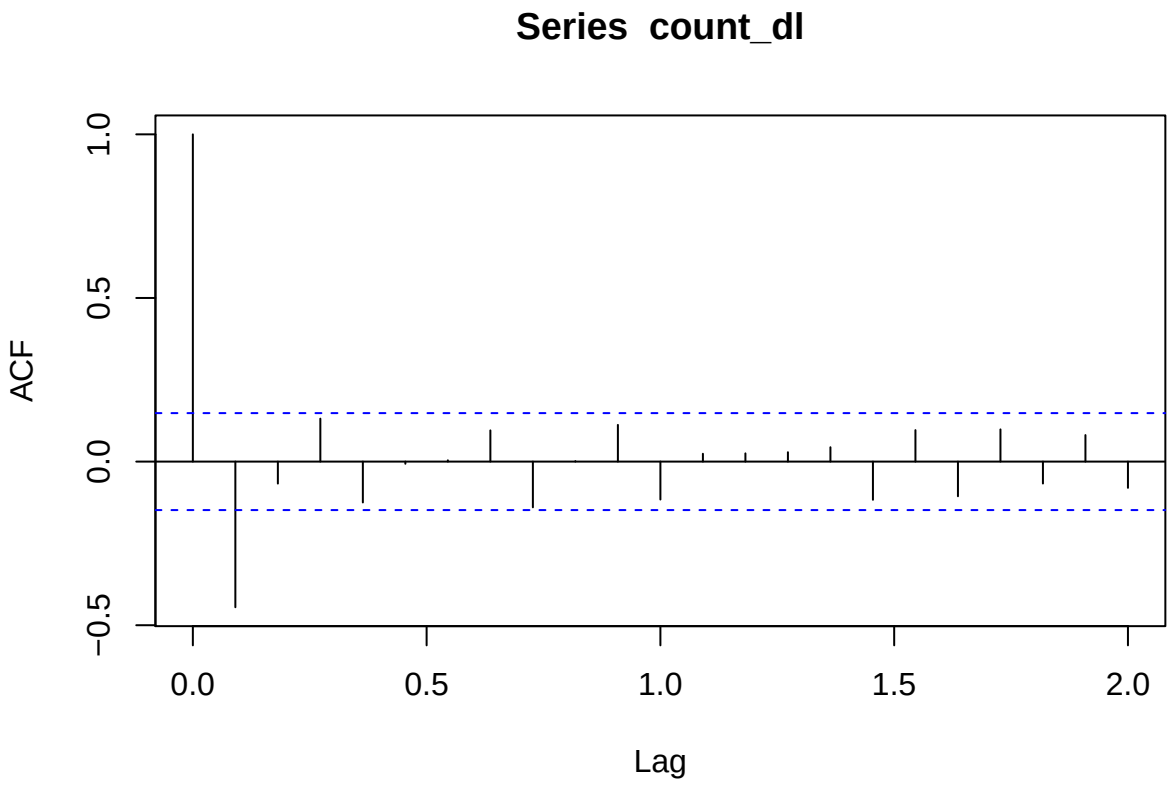
```
deseasonal_cnt <-seasadj(decomp)
count_dl = diff(deseasonal_cnt,differences = 1) # remove seasonality
acf <- acf(count_dl)
```




```
mmky1lag(dse)
```

```
## Corrected Zc  new P-value         N/N*   Original Z  old P.value
## 6.310241e-01 5.280248e-01 3.780933e+00 1.227002e+00 2.198217e-01
##          Tau  Sen's slope old.variance new.variance
## 6.233766e-02 5.034558e-05 6.108667e+05 2.309646e+06
```

```
count=ts(dsw[1:176],frequency = 11)
decomp=stl(count,"periodic")
deseasonal_cnt <-seasadj(decomp)
count_dl = diff(deseasonal_cnt,differences = 1)
acf <- acf(count_dl)
```



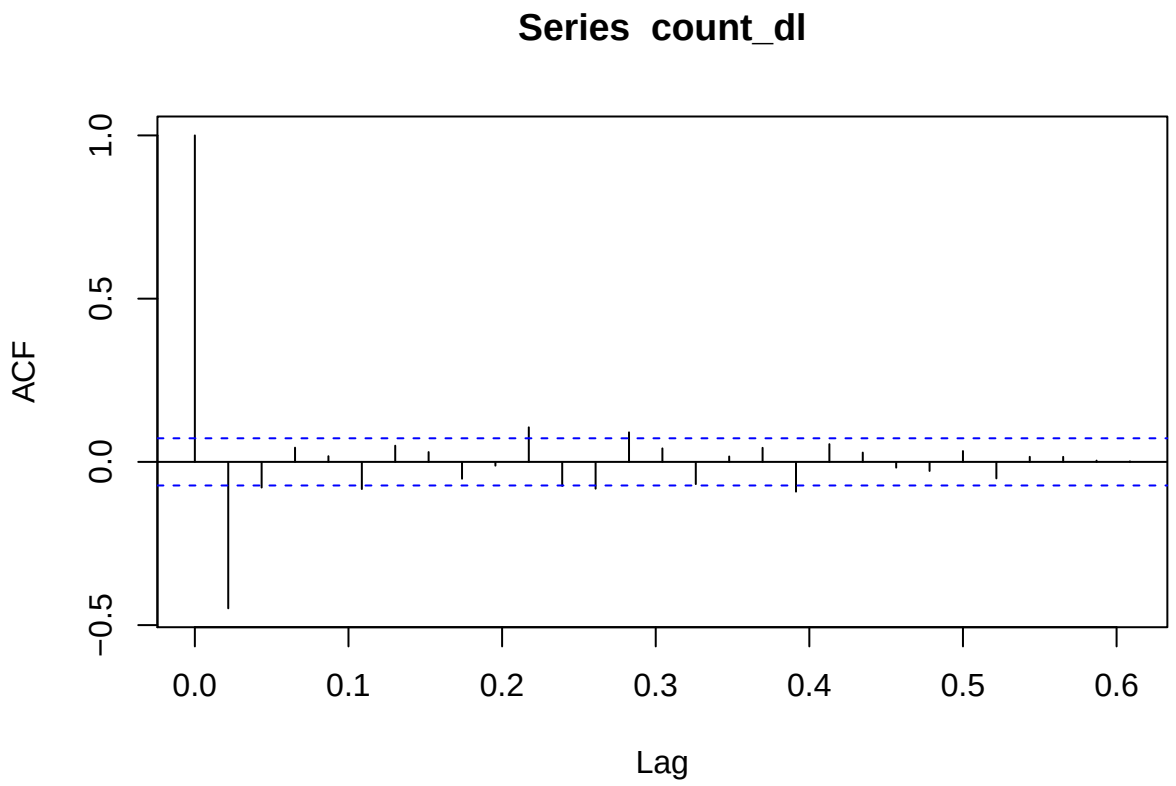

```
mmky1lag(dsw)
```

```
## Corrected Zc  new P-value         N/N*   Original Z  old P.value
## 1.377303e+00 1.684185e-01 2.855352e+00 2.327338e+00 1.994728e-02
##          Tau  Sen's slope old.variance new.variance
## 1.181818e-01 6.717374e-05 6.108667e+05 1.744240e+06
```

Test frontal density (FD) (MODIS data)

```
d <- read.csv('MODfd.csv',header=TRUE)
dse<- d$fdSE # South East Australia - Adaptive Canny method
dsw<- d$fdSW # South West Australia - Adaptive Canny method

# fill 'nan' FD values
avg <- mean(na.omit(dse))
dse[is.na(dse)] <- avg
avg <- mean(na.omit(dsw))
dsw[is.na(dsw)] <- avg

count=ts(dse[1:736],frequency = 46)
decomp=stl(count,"periodic")
```

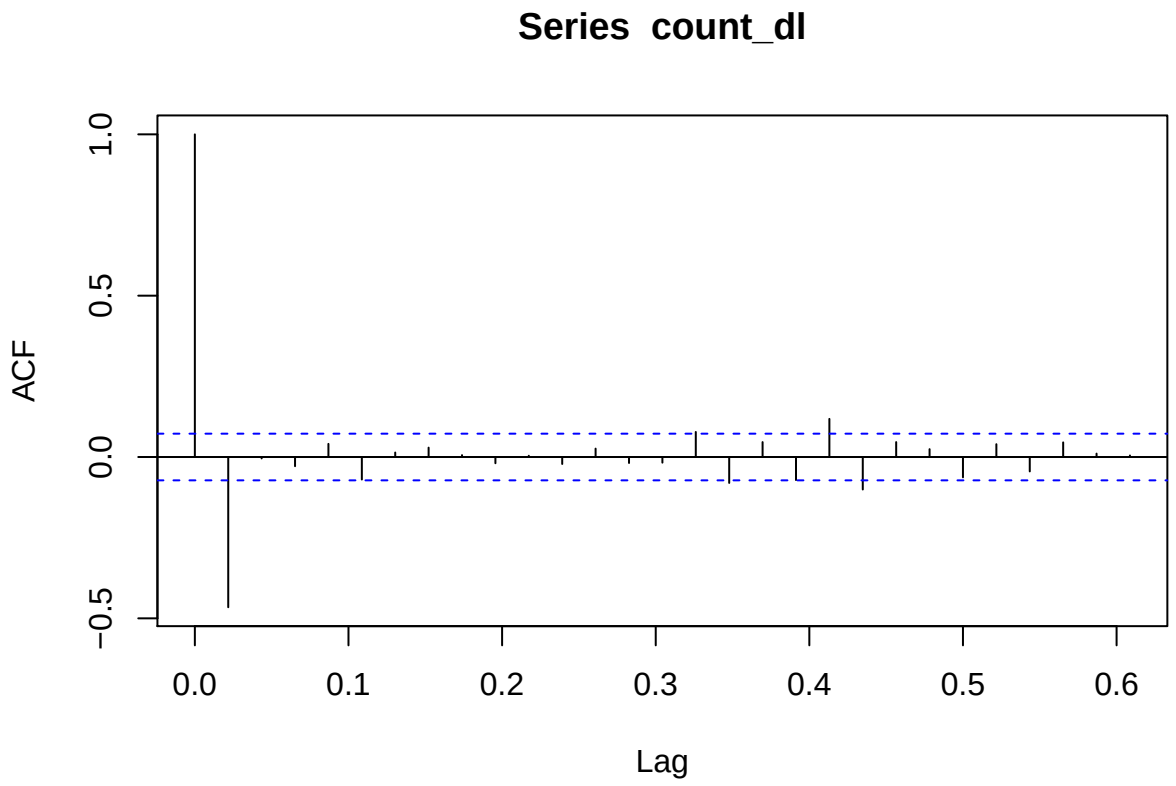
```
deseasonal_cnt <-seasadj(decomp)
count_dl = diff(deseasonal_cnt,differences = 1) # remove seasonality
acf <- acf(count_dl)
```




```
mmky1lag(dse)
```

```
## Corrected Zc  new P-value         N/N*   Original Z  old P.value
## 1.700529e+00 8.903145e-02 1.989357e+00 2.398504e+00 1.646221e-02
##          Tau  Sen's slope old.variance new.variance
## 5.908385e-02 5.436074e-06 4.438873e+07 8.830502e+07
```

```
count=ts(dsw[1:736],frequency = 46)
decomp=stl(count,"periodic")
deseasonal_cnt <-seasadj(decomp)
count_dl = diff(deseasonal_cnt,differences = 1) # remove seasonality
acf <- acf(count_dl)
```




```
mmky1lag(dsw)
```

```
## Corrected Zc  new P-value         N/N*   Original Z  old P.value
## 2.827865e+00 4.685959e-03 2.105288e+00 4.103122e+00 4.076126e-05
##          Tau  Sen's slope old.variance new.variance
## 1.010722e-01 8.862998e-06 4.438875e+07 9.345110e+07
```
