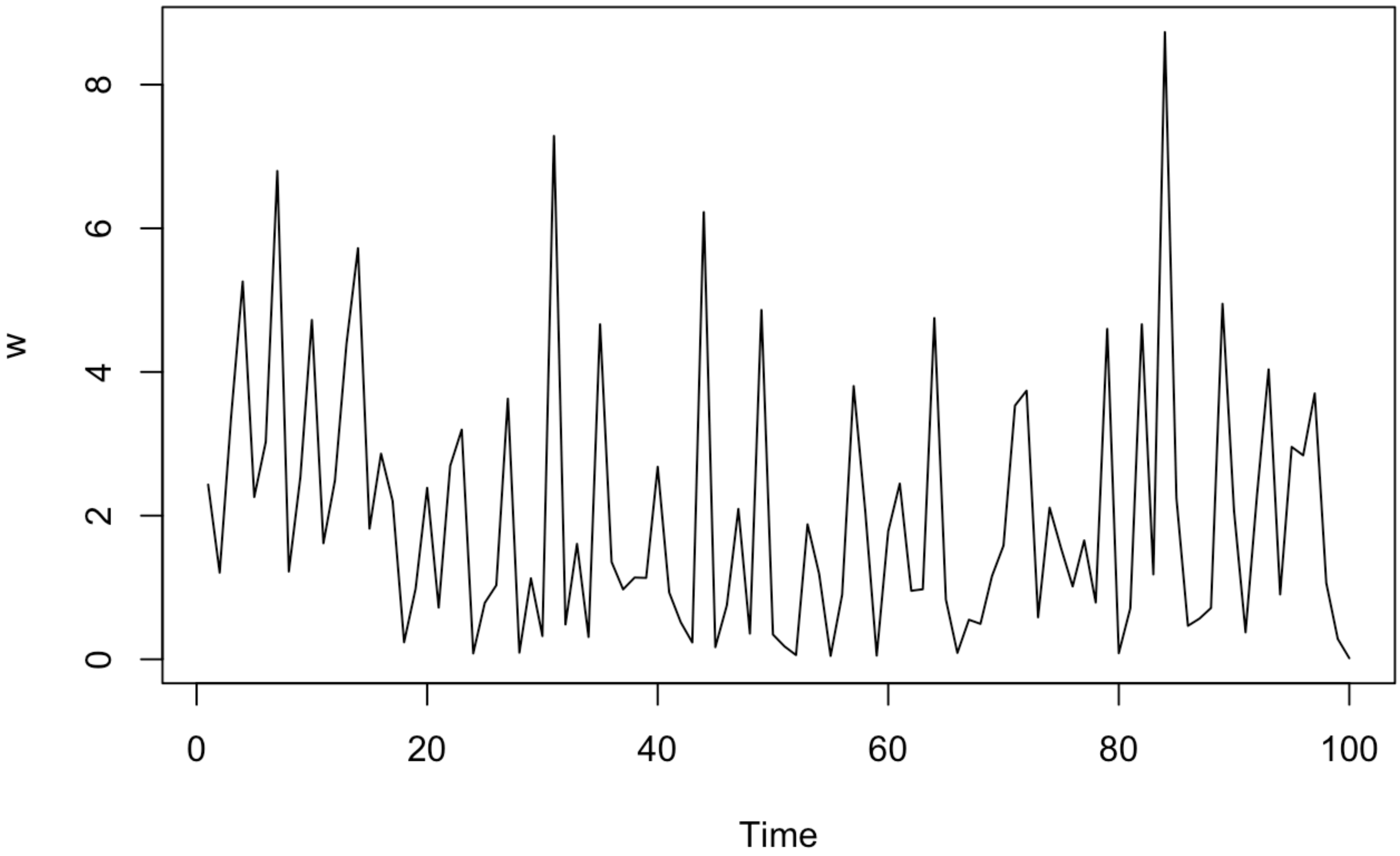
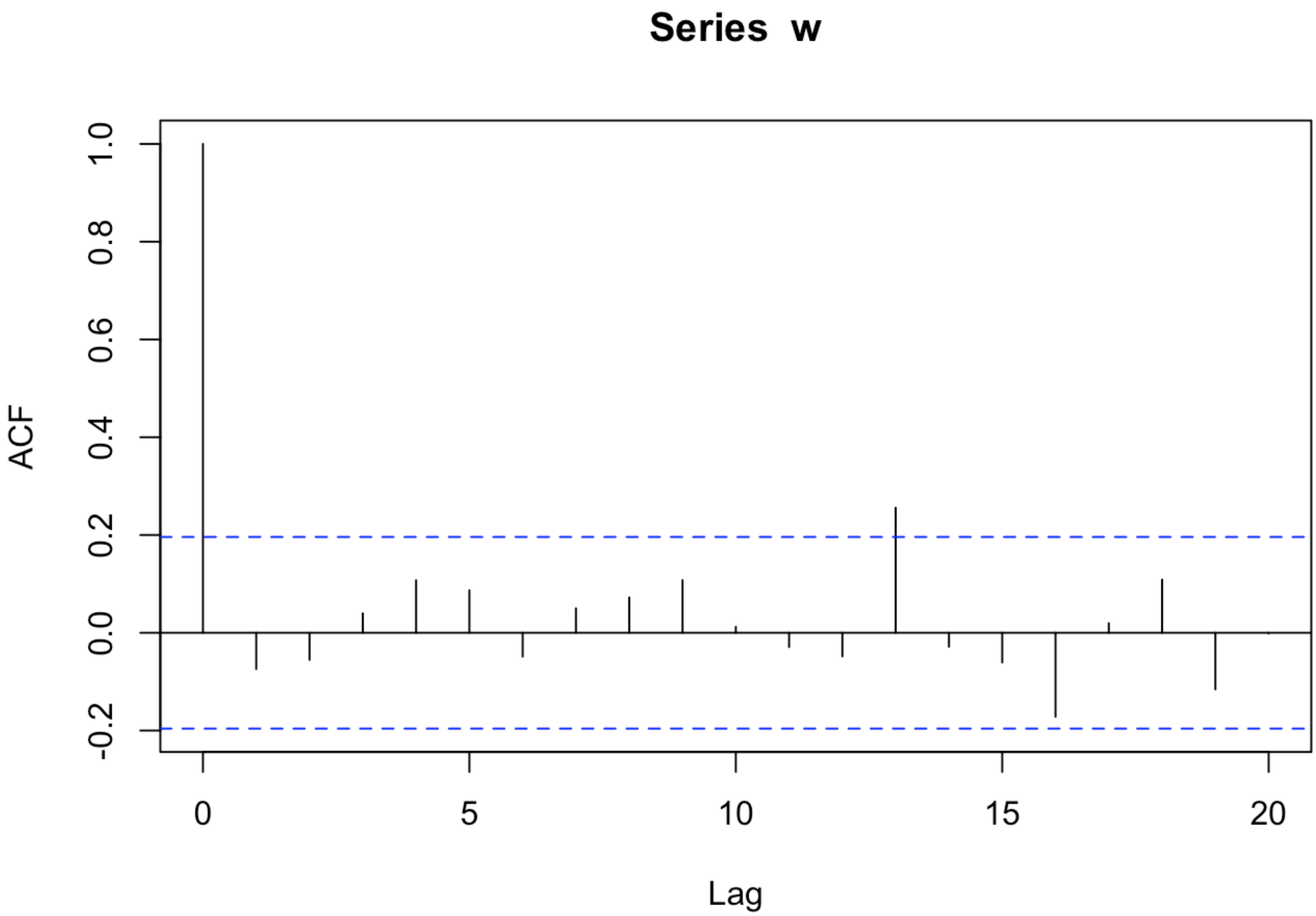
HW_2

Question 1

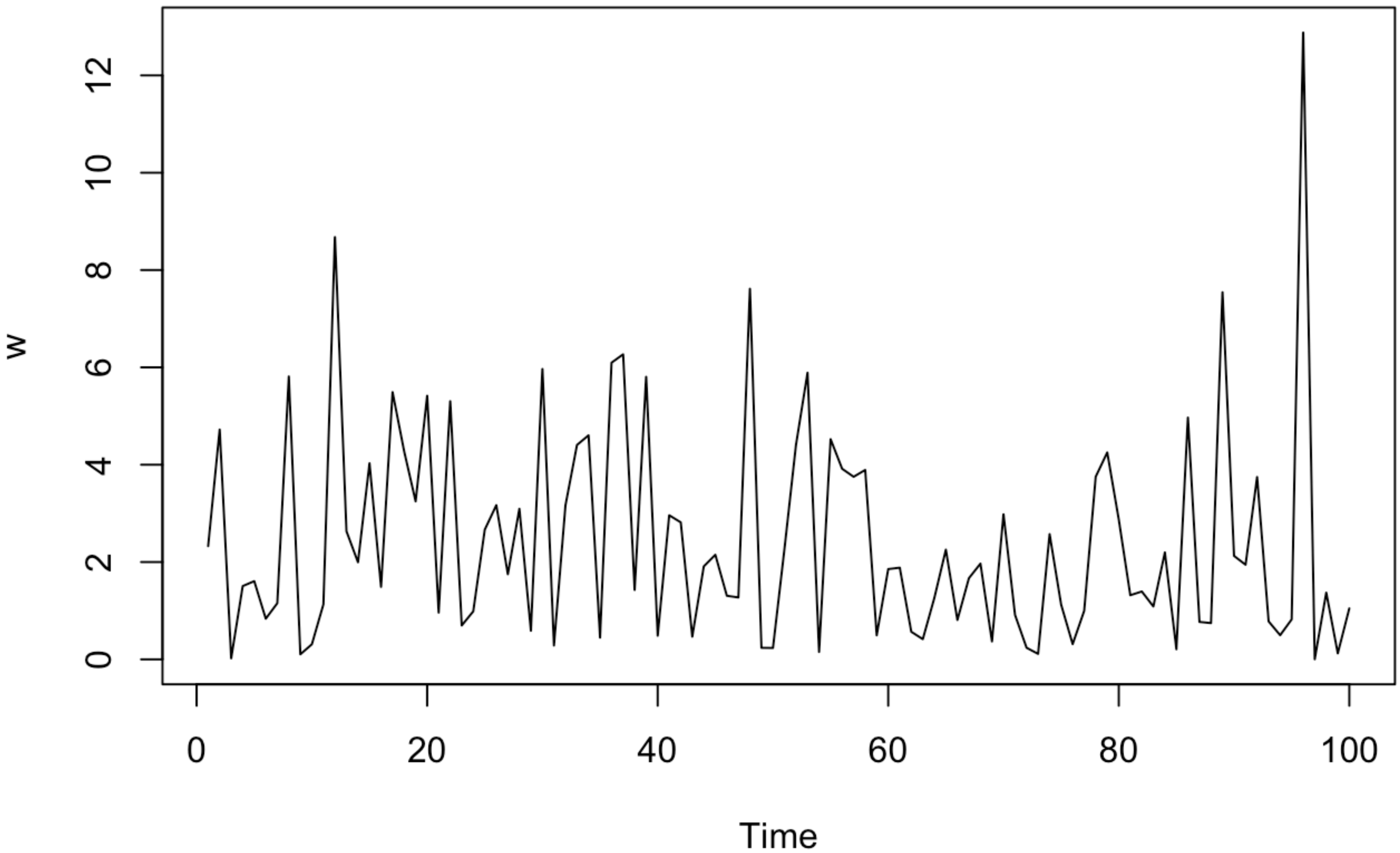
```
w <- rexp(100,rate=1/2)
plot.ts(w)
```



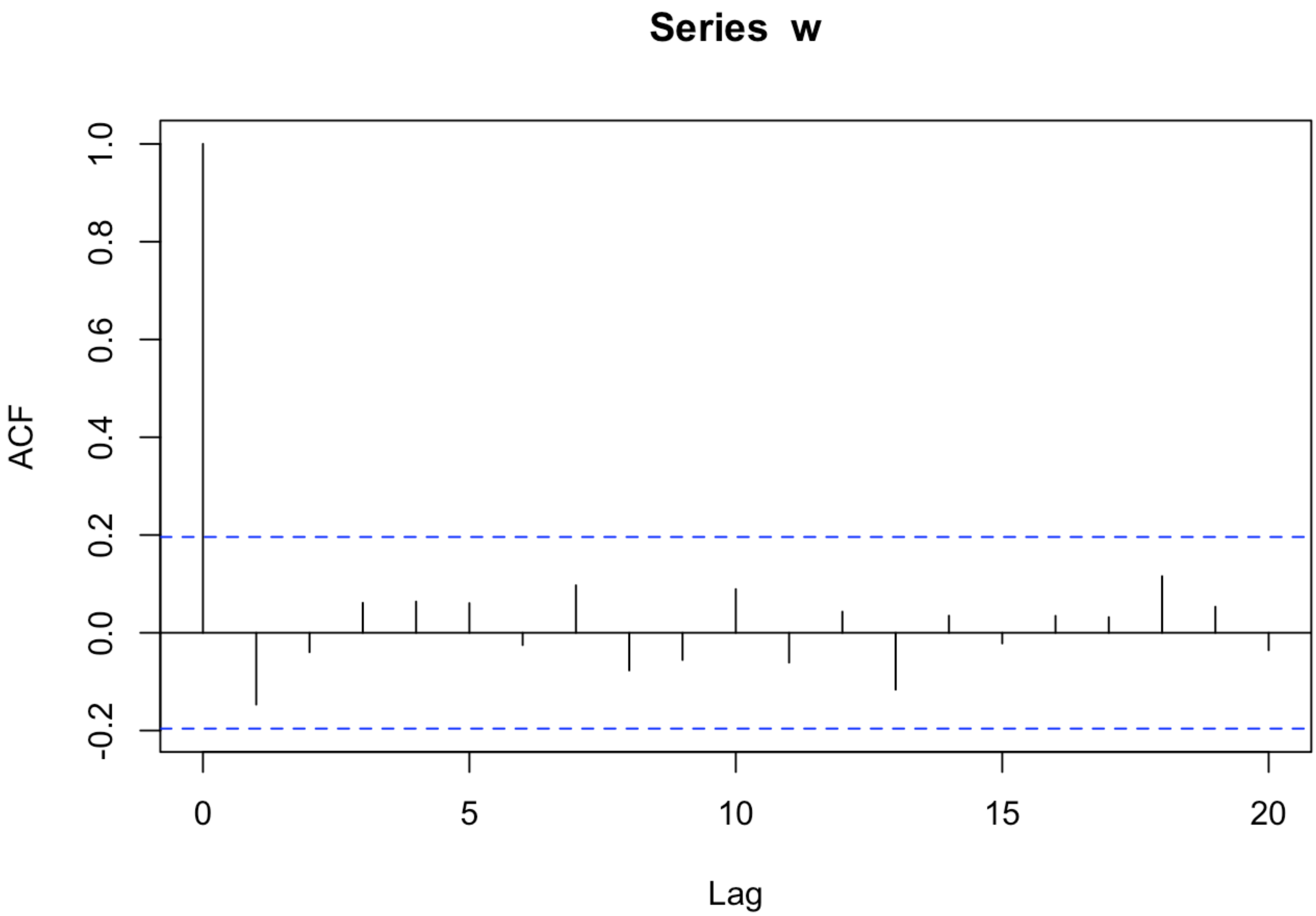

```
acf(w)
```



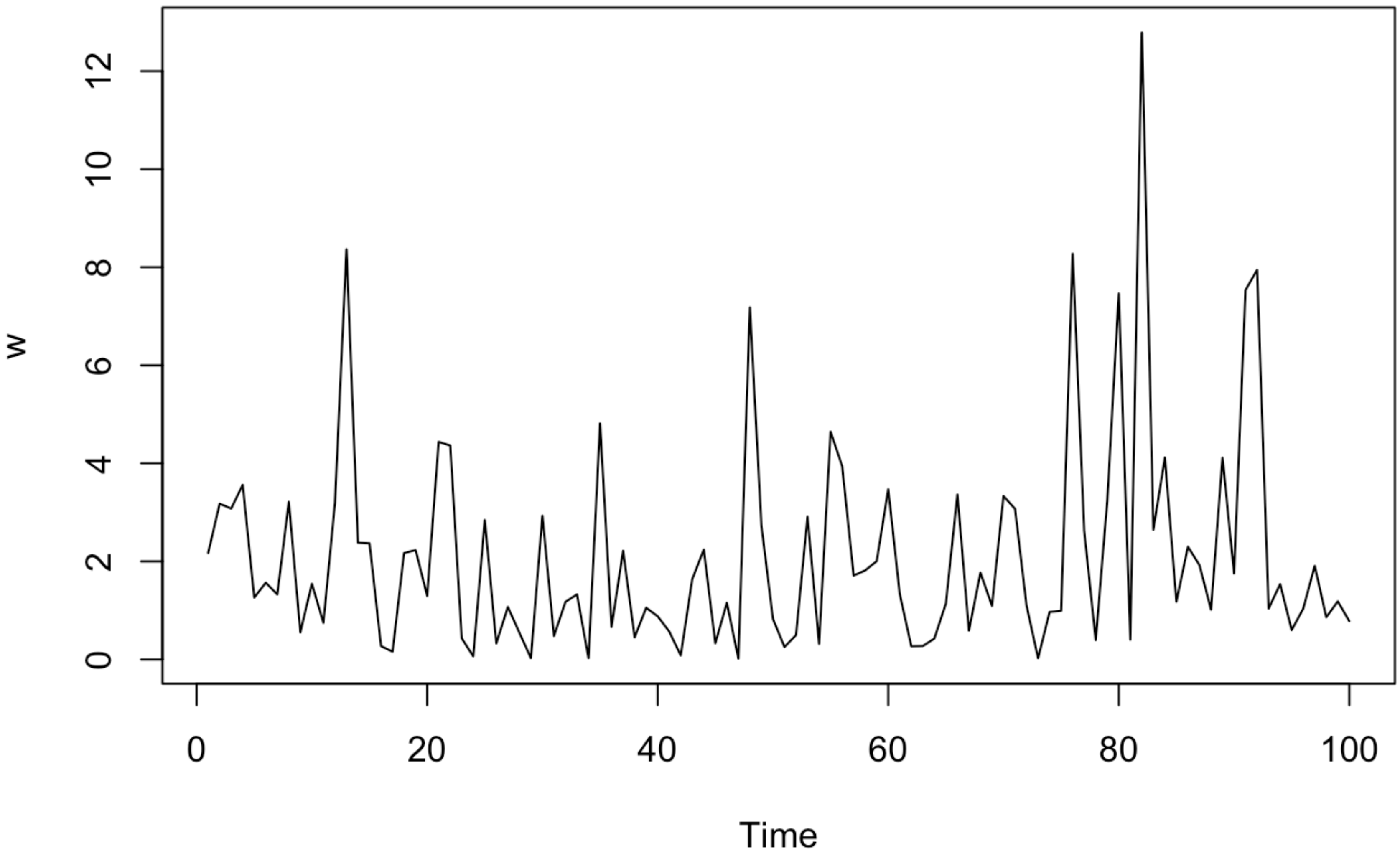

```
w <- rexp(100,rate=1/2)
plot.ts(w)
```



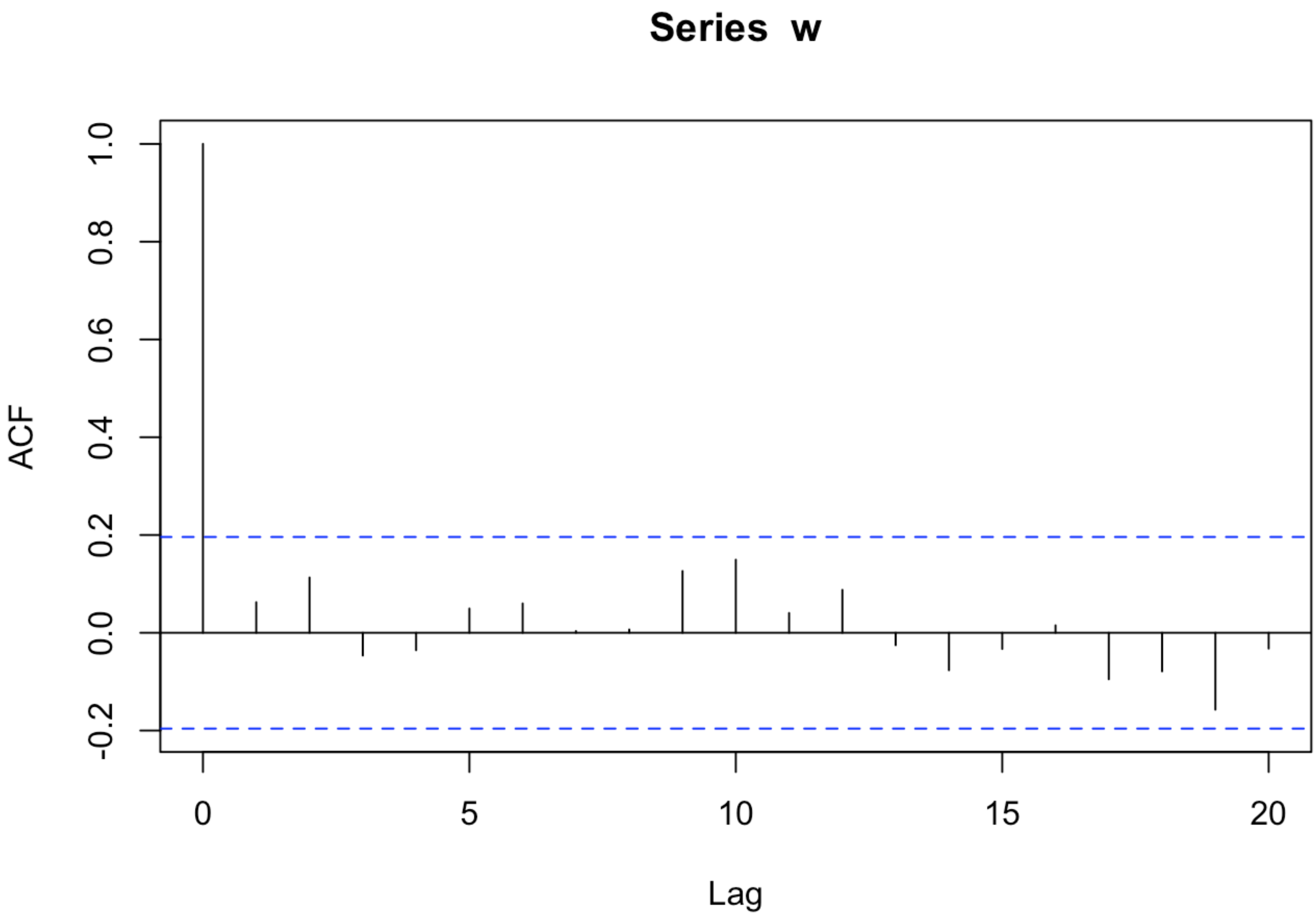

```
acf(w)
```



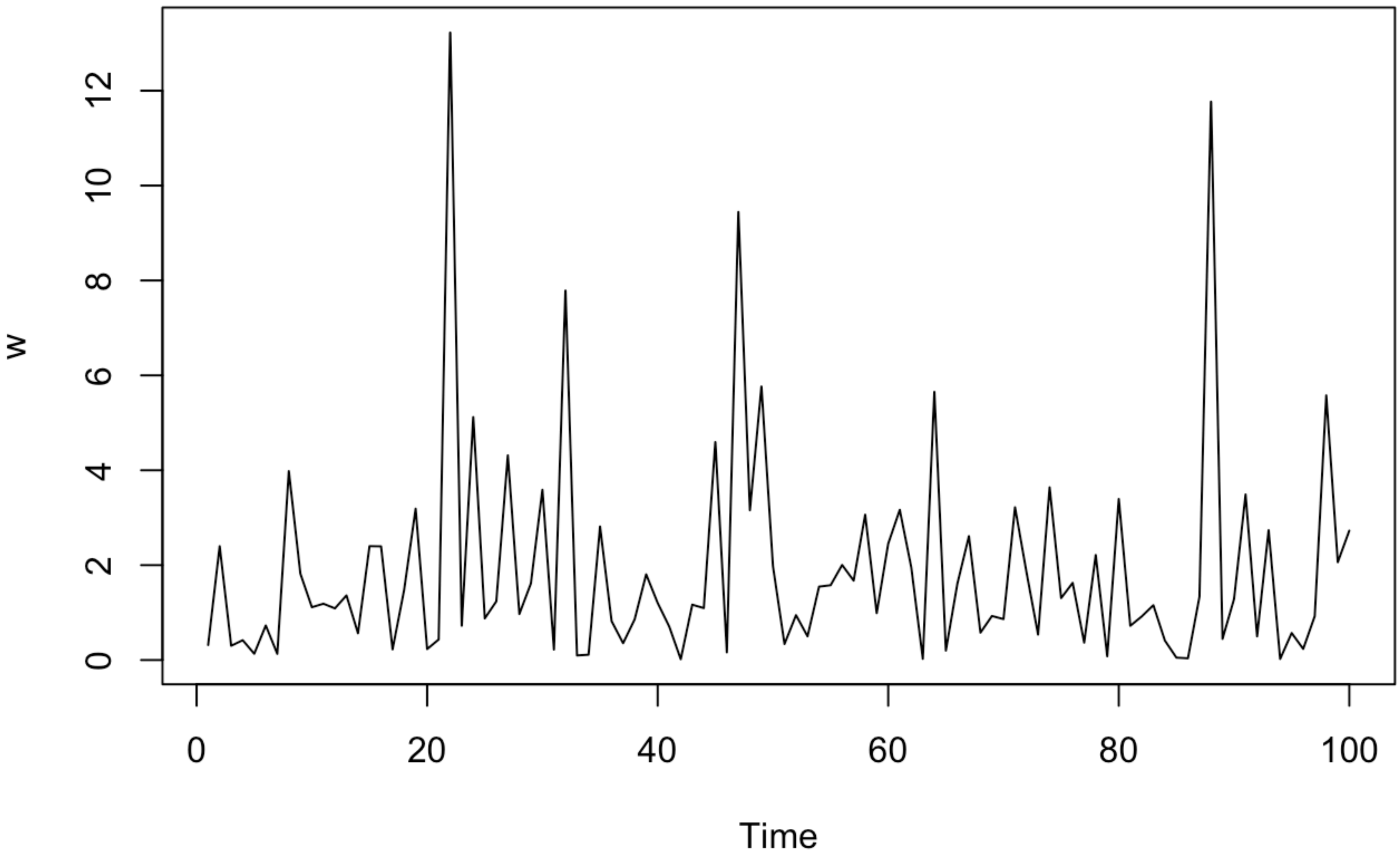

```
w <- rexp(100,rate=1/2)
plot.ts(w)
```



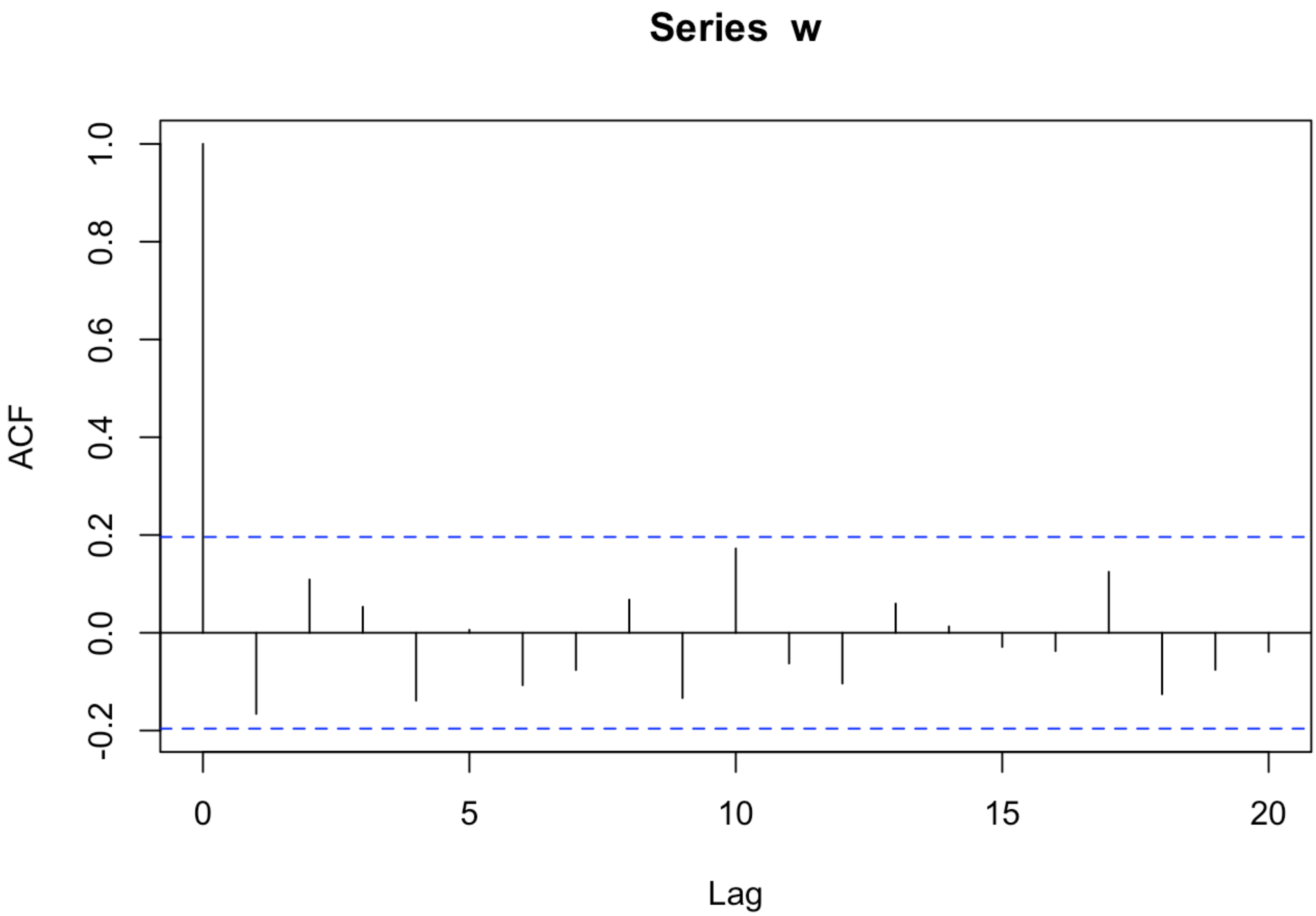

```
acf(w)
```



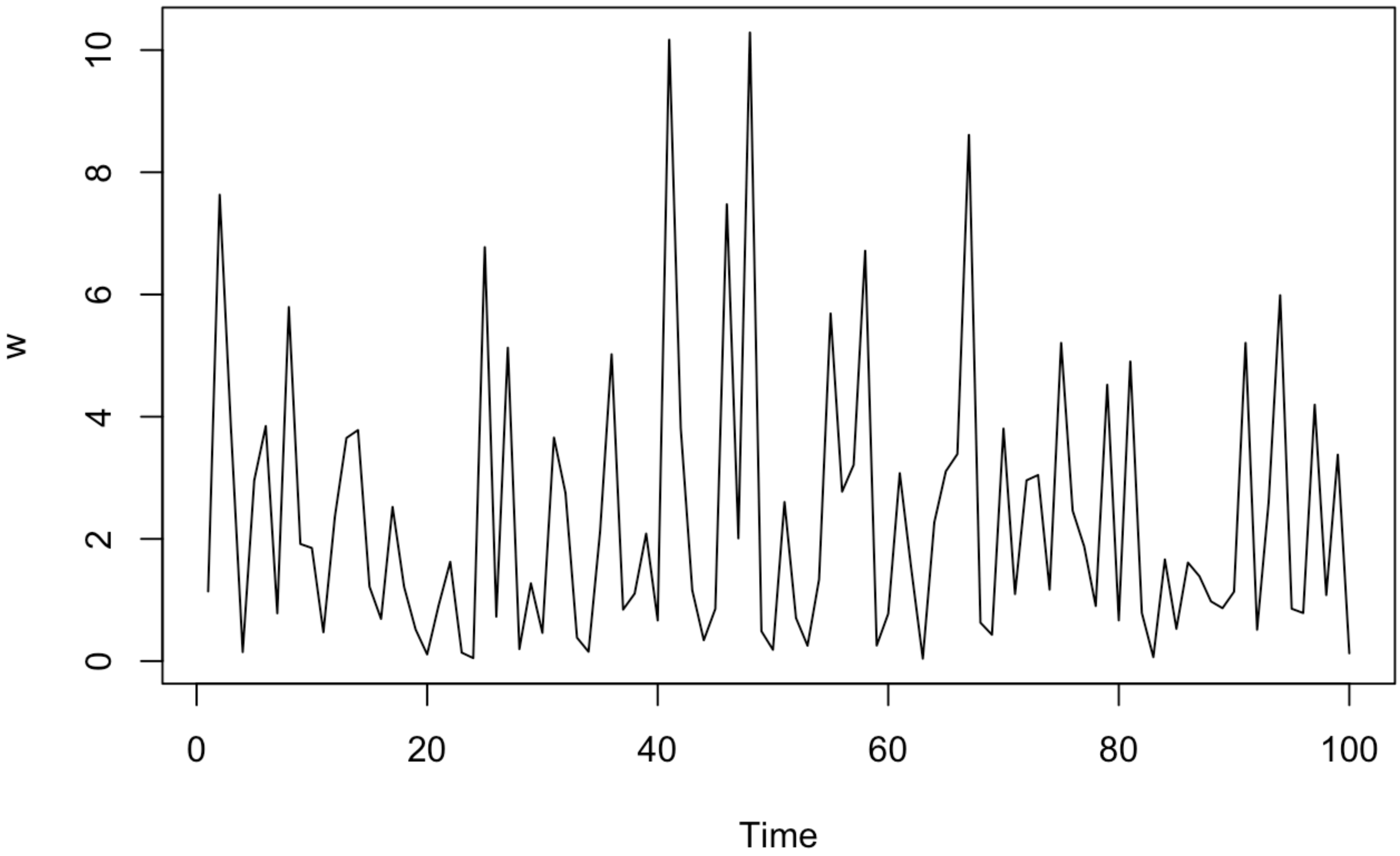

```
w <- rexp(100,rate=1/2)
plot.ts(w)
```



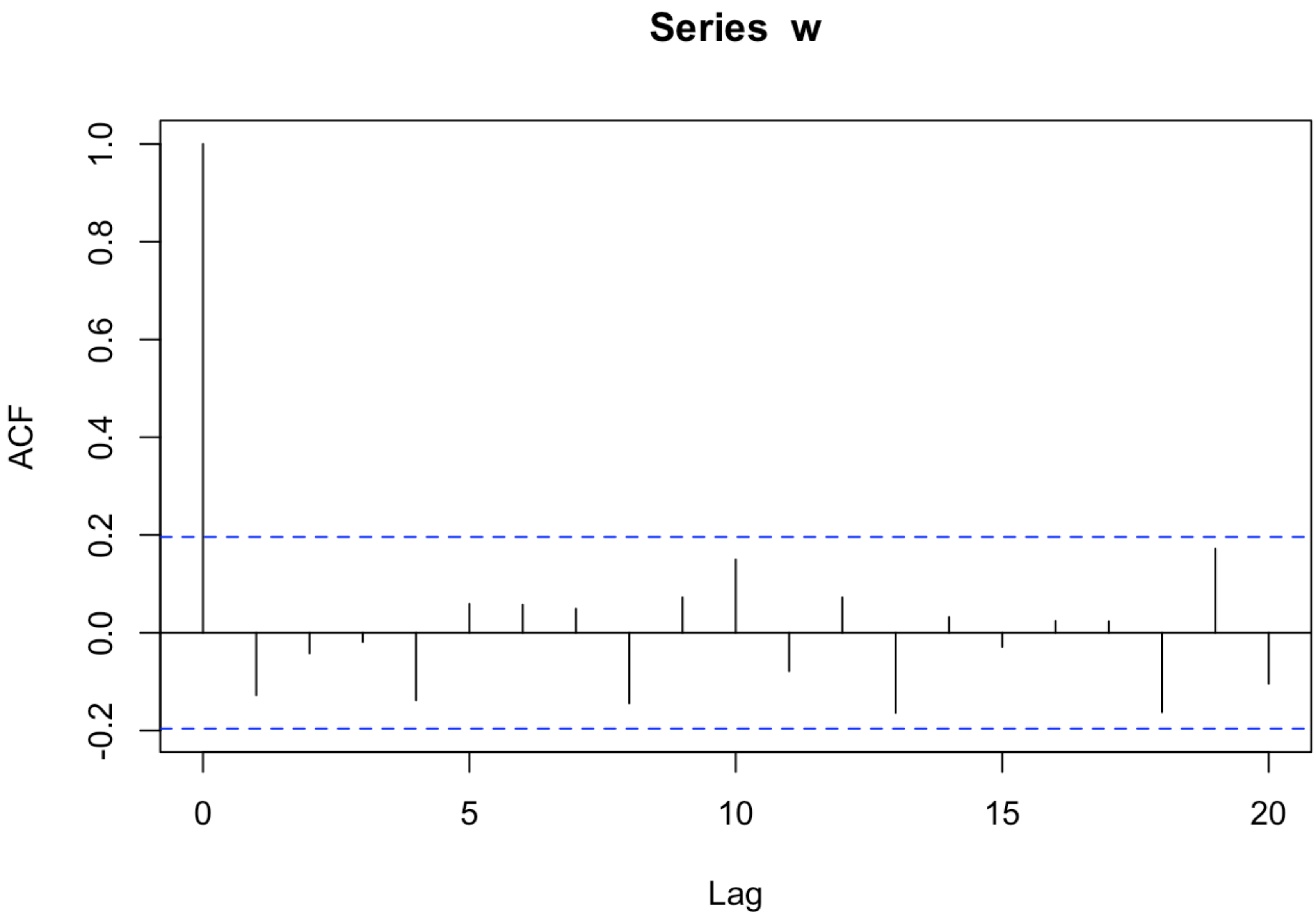

```
acf(w)
```




```
w <- rexp(100,rate=1/2)
plot.ts(w)
```



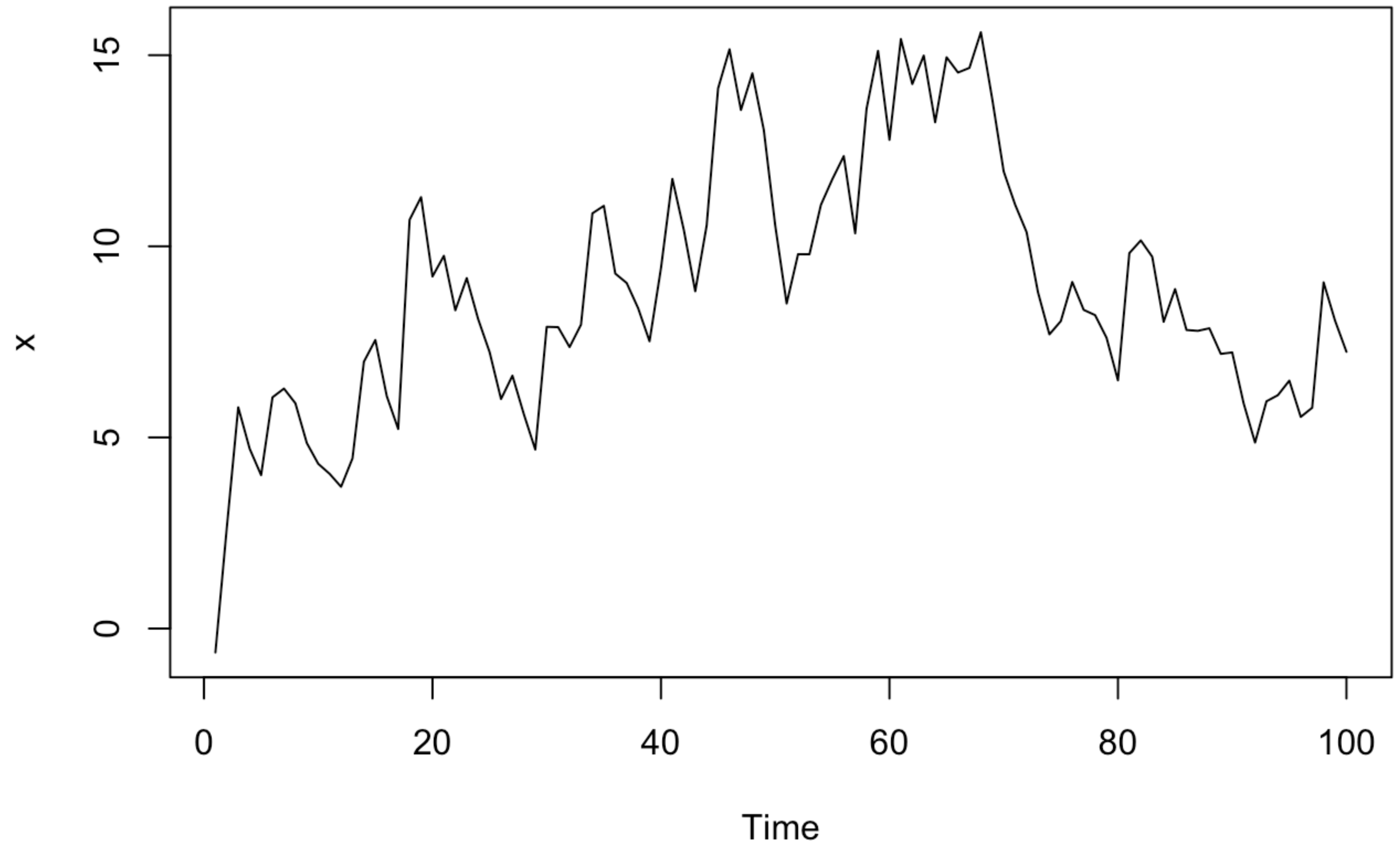

```
acf(w)
```



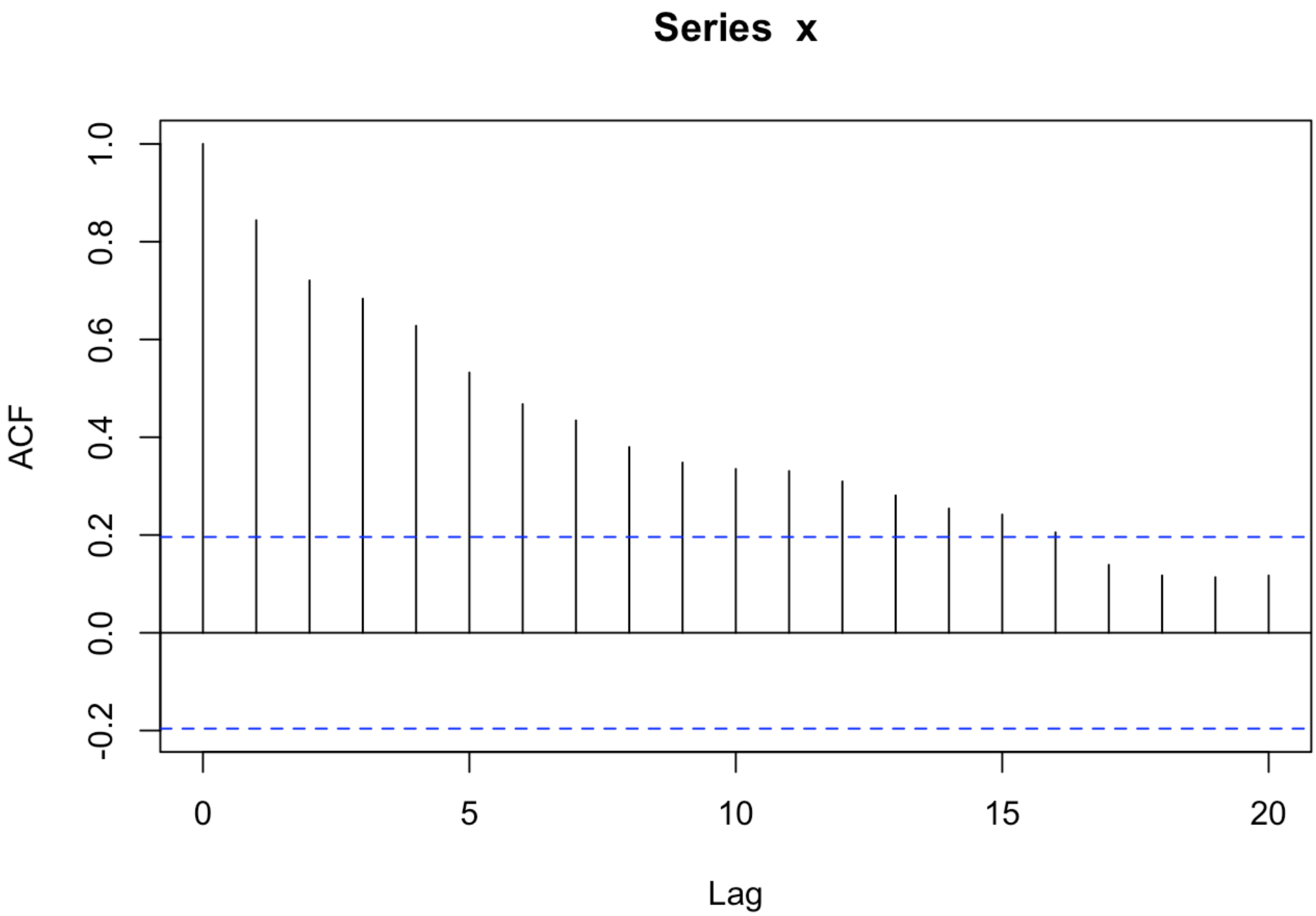
The autocorrelation are nearly always within the confidence interval, with one or two points of lag being the exception from example to example.

Question 2

```
set.seed(1)
x <- w <- rnorm(100)
w <- rexp(100,rate=1/2)
for (t in 2:100) x[t] <- 0.8 * x[t - 1] + w[t]
plot.ts(x, type = "l")
```



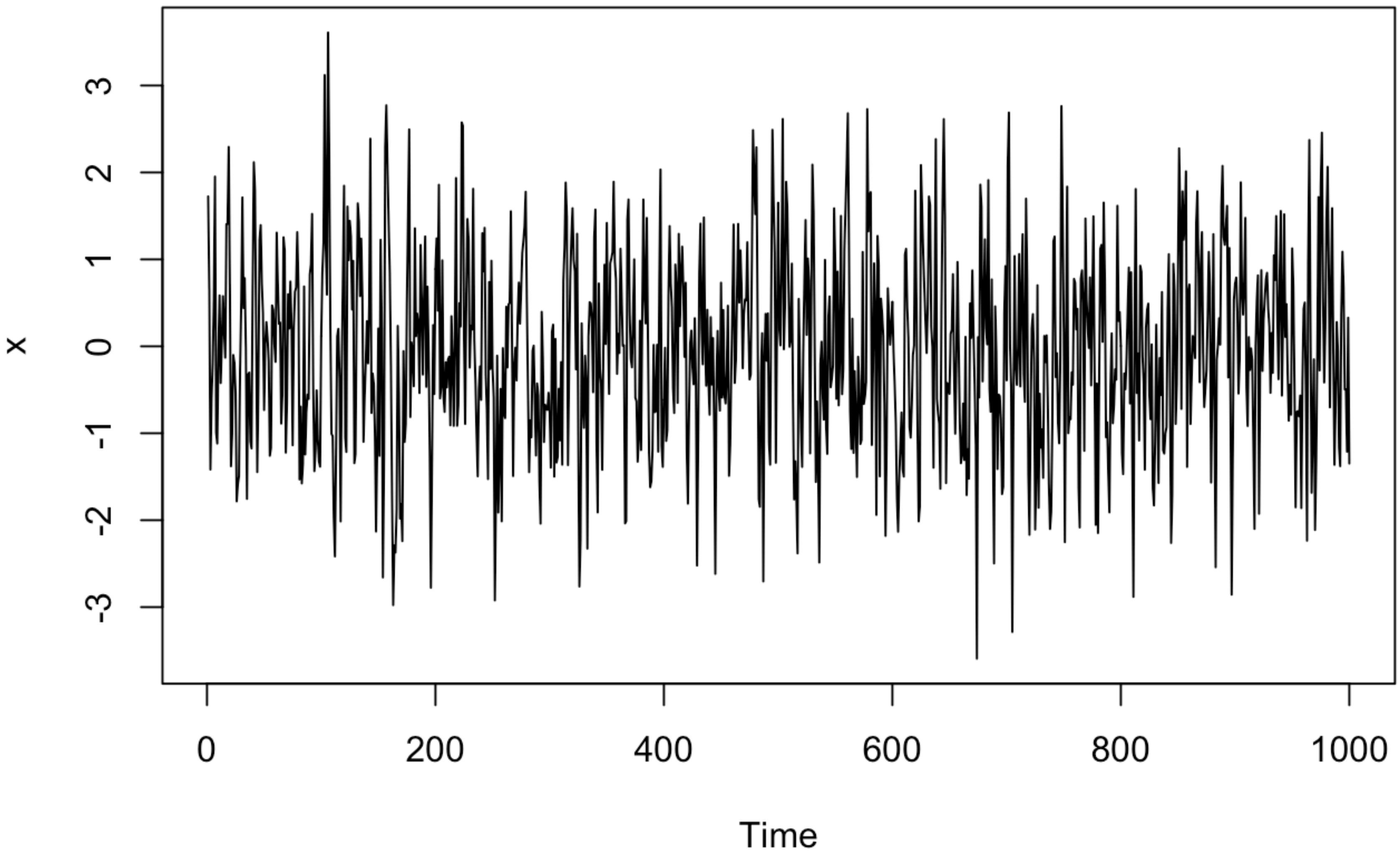

```
acf(x)
```



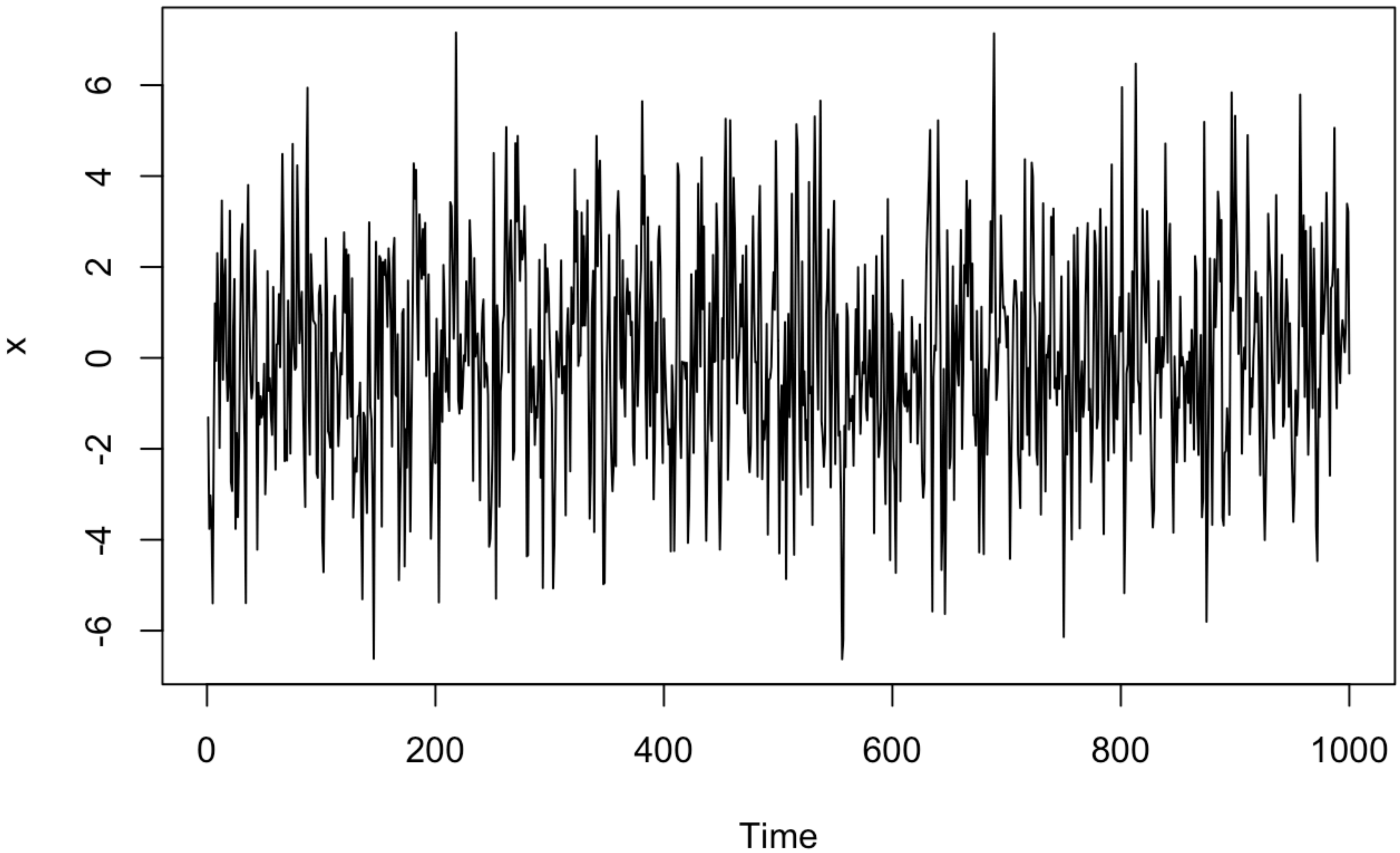
The above graph shows that values from 0 lag to about 16 lag are statistically significant as they are outside the confidence interval. The exponetial white noise shows more significanace due to being outside the confidence interval.

Question 3

```
x <- rnorm(100,mean=0,sd=1)
x <- w <- rnorm(1000)
for (t in 2:1000) x[t] <- .5*w[t - 1] + w[t]
plot.ts(x)
```




```
x <- rnorm(100,mean=0,sd=1)
x <- w <- rnorm(1000)
for (t in 2:1000) x[t] <- 2*w[t - 1] + w[t]
plot.ts(x)
```



From the two time series plots above we can see that they can be distinguished by the x-axis becoming larger due to the multiplication of 4 to the w[t-1] part of the equation.

Question 4

```
nhtemp
```

```
## Time Series:
## Start = 1912
## End = 1971
## Frequency = 1
##  [1] 49.9 52.3 49.4 51.1 49.4 47.9 49.8 50.9 49.3 51.9 50.8 49.6 49.3 50.6
## [15] 48.4 50.7 50.9 50.6 51.5 52.8 51.8 51.1 49.8 50.2 50.4 51.6 51.8 50.9
## [29] 48.8 51.7 51.0 50.6 51.7 51.5 52.1 51.3 51.0 54.0 51.4 52.7 53.1 54.6
## [43] 52.0 52.0 50.9 52.6 50.2 52.6 51.6 51.9 50.5 50.9 51.7 51.4 51.7 50.8
## [57] 51.9 51.8 51.9 53.0
```

```
library(xts)
```

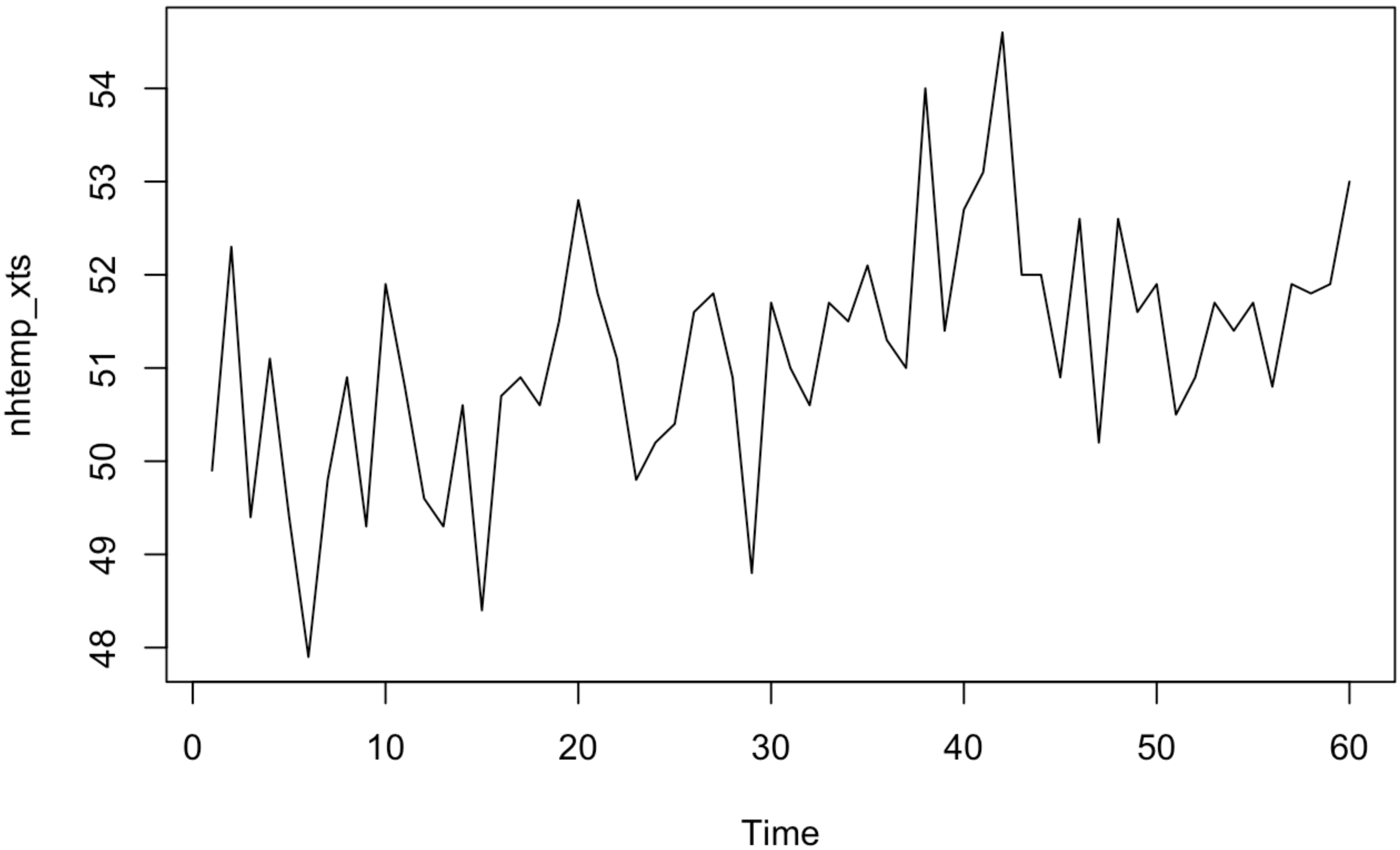
```
## Loading required package: zoo
```

```
## Warning: package 'zoo' was built under R version 3.3.2
```

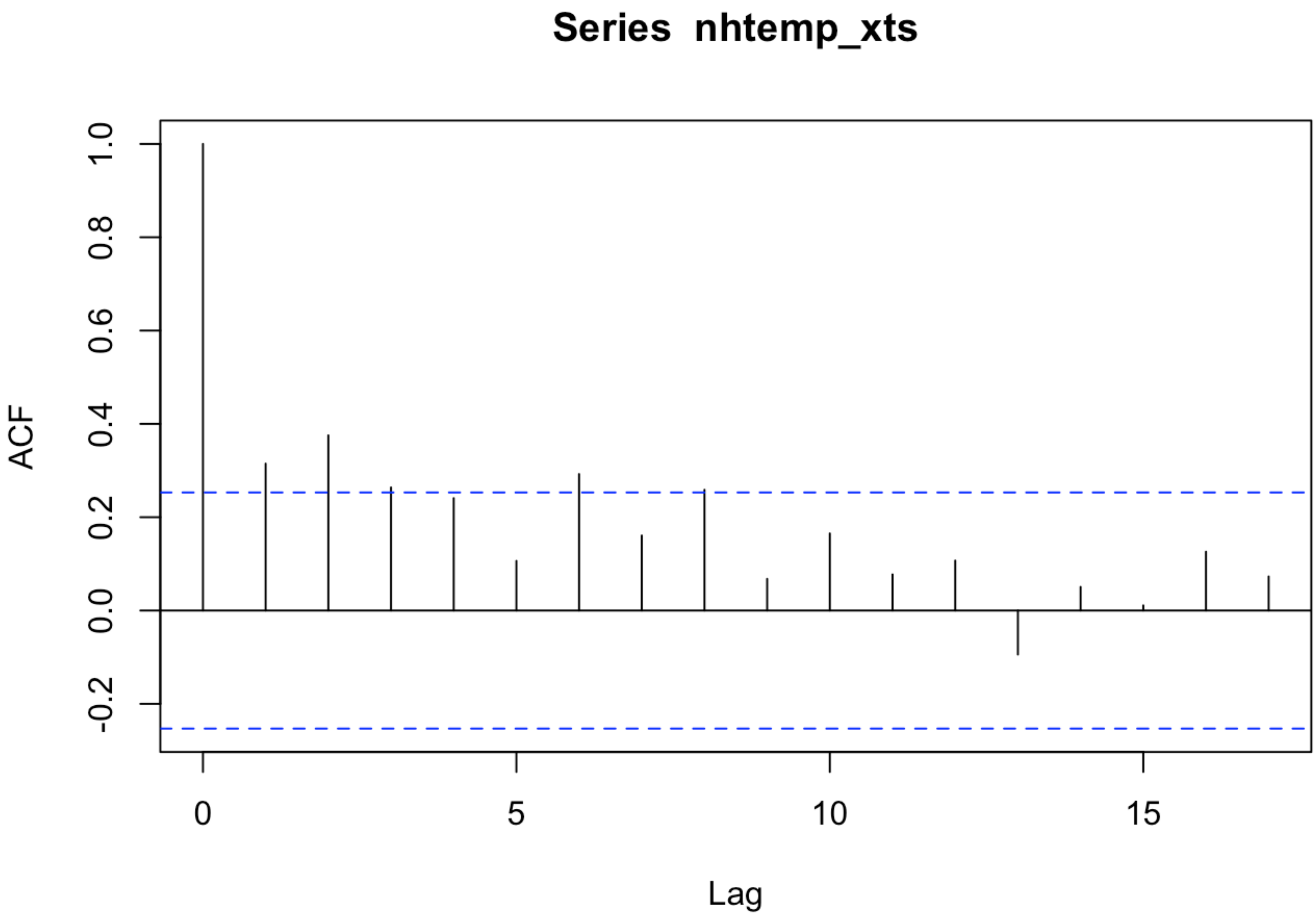
```
##
## Attaching package: 'zoo'
```

```
## The following objects are masked from 'package:base':
##
##     as.Date, as.Date.numeric
```

```
nhtemp_xts <- as.xts(nhtemp)
plot.ts(nhtemp_xts)
```




```
acf(nhtemp_xts)
```




```
nhtemp.ma0 <- arima(nhtemp_xts, order = c(0, 0, 0))
nhtemp.ma1 <- arima(nhtemp_xts, order = c(0, 0, 1))
nhtemp.ma2 <- arima(nhtemp_xts, order = c(0, 0, 2))
nhtemp.ma3 <- arima(nhtemp_xts, order = c(0, 0, 3))
nhtemp.ar1 <- arima(nhtemp_xts, order = c(1, 0, 0))
nhtemp.ar2 <- arima(nhtemp_xts, order = c(2, 0, 0))
nhtemp.ar3 <- arima(nhtemp_xts, order = c(3, 0, 0))
AIC(nhtemp.ma0)
```

```
## [1] 201.5305
```

```
AIC(nhtemp.ma1)
```

```
## [1] 199.5833
```

```
AIC(nhtemp.ma2)
```

```
## [1] 196.7438
```

```
AIC(nhtemp.ma3)
```

```
## [1] 195.5167
```

```
AIC(nhtemp.ar1)
```

```
## [1] 197.0144
```

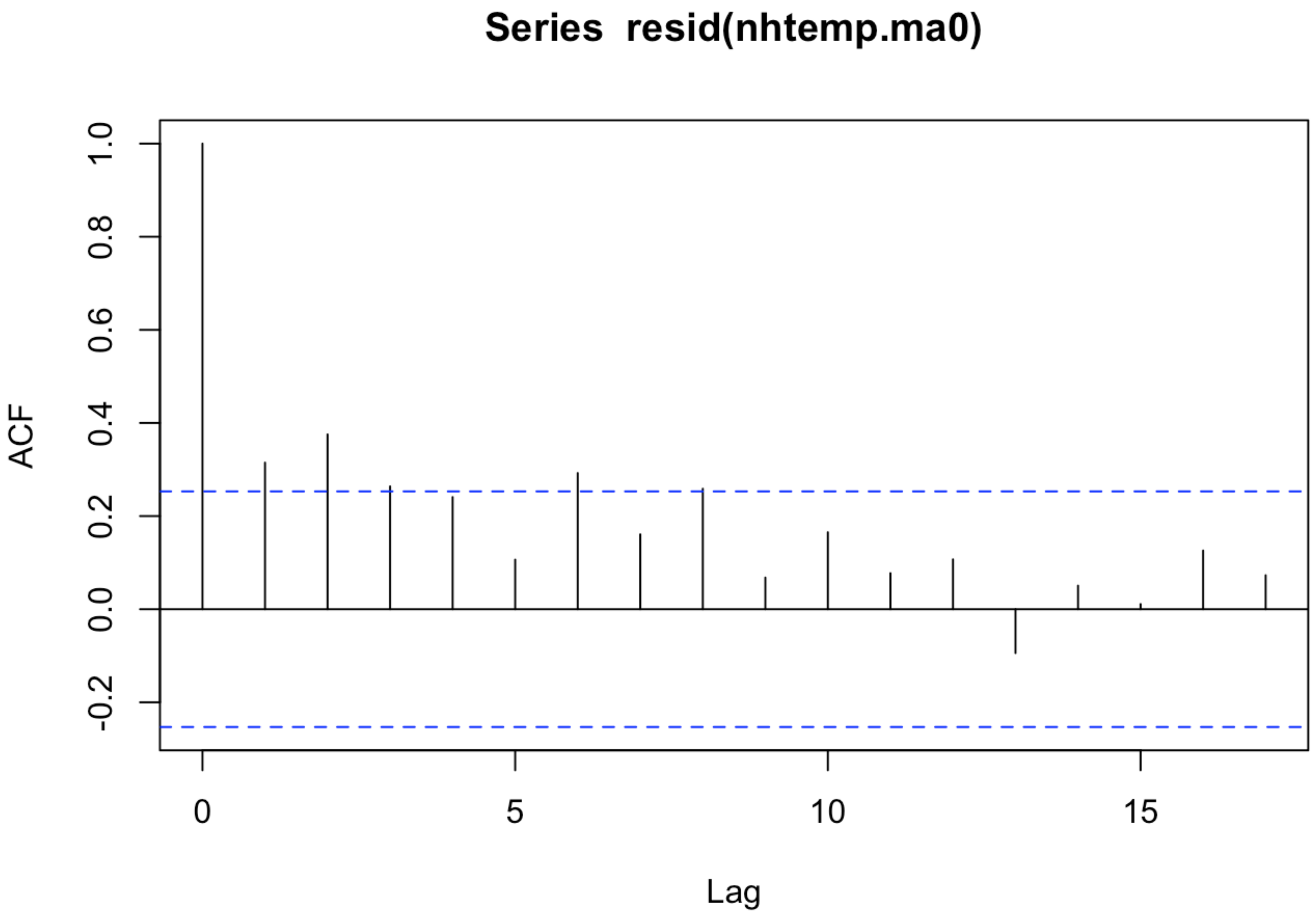
```
AIC(nhtemp.ar2)
```

```
## [1] 192.9438
```

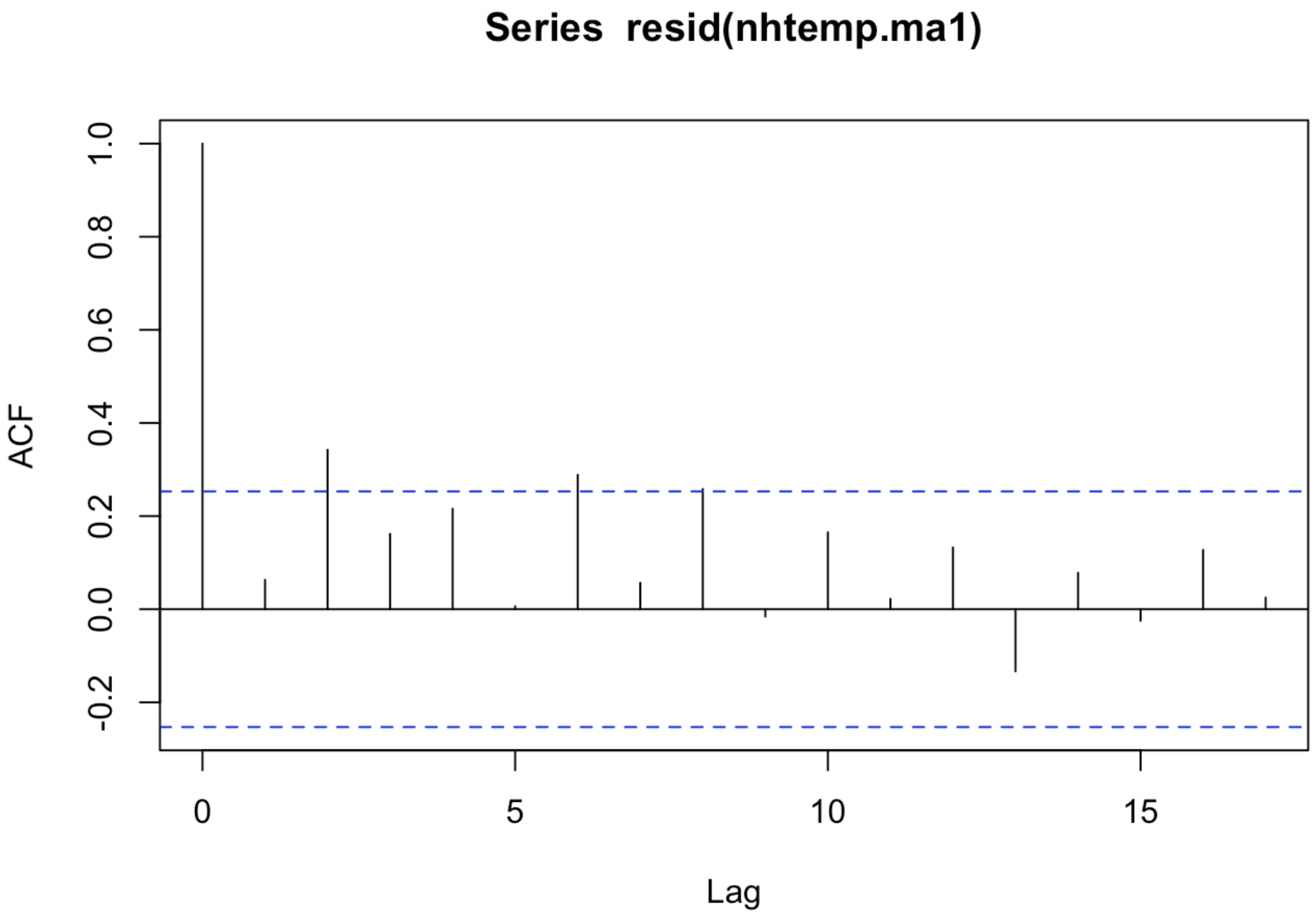
```
AIC(nhtemp.ar3)
```

```
## [1] 194.3166
```

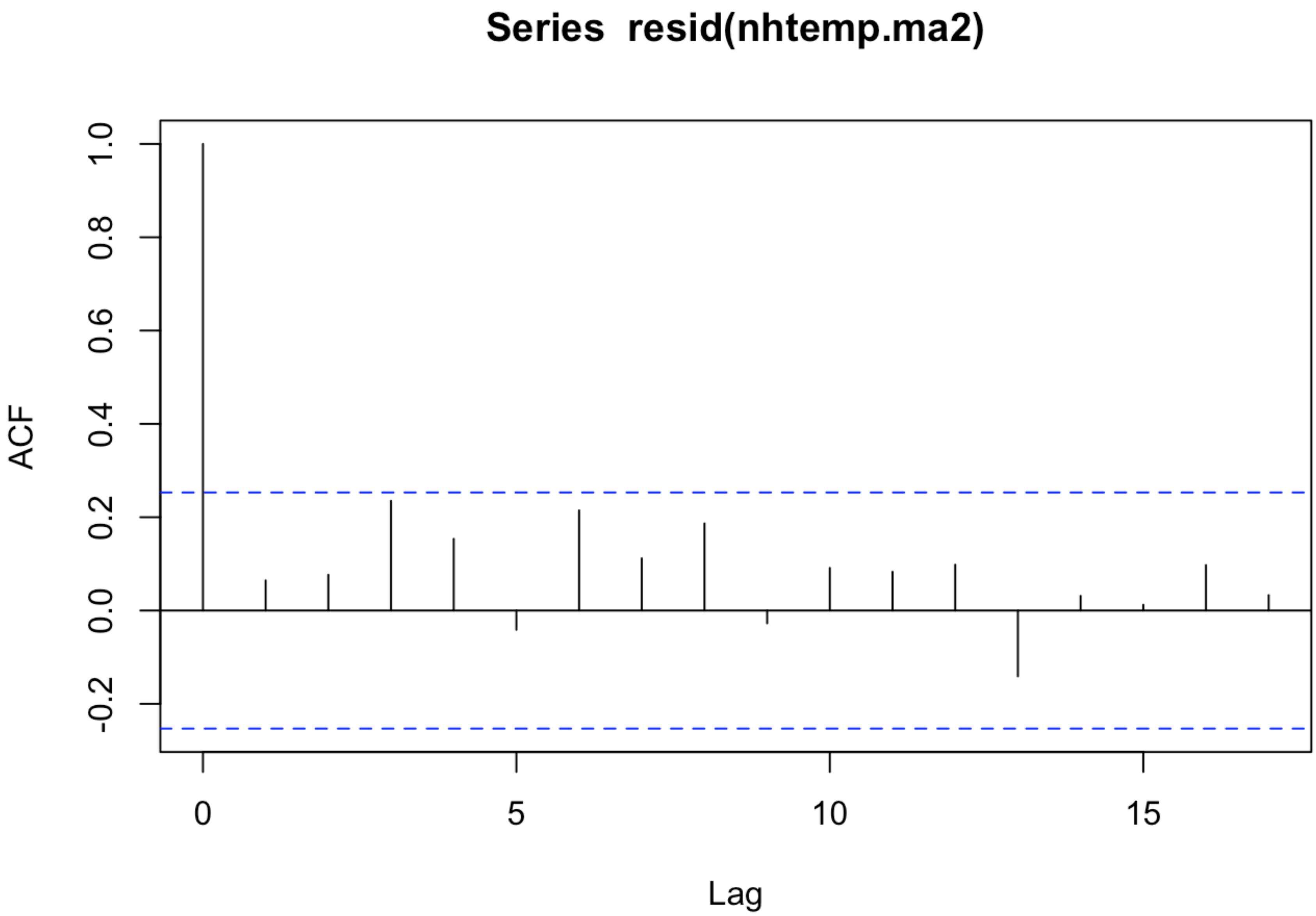
```
acf(resid(nhtemp.ma0))
```



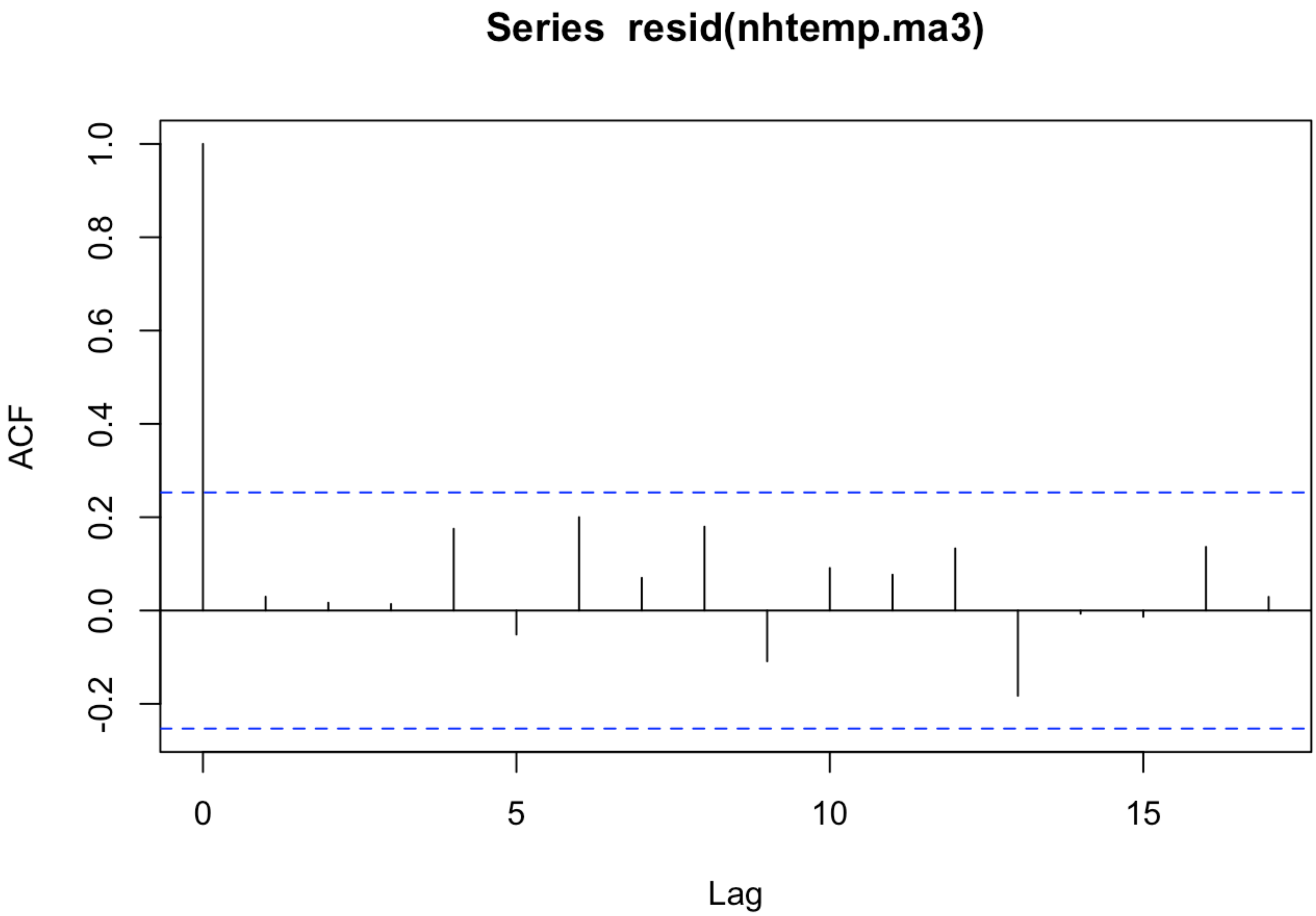

```
acf(resid(nhtemp.ma1))
```



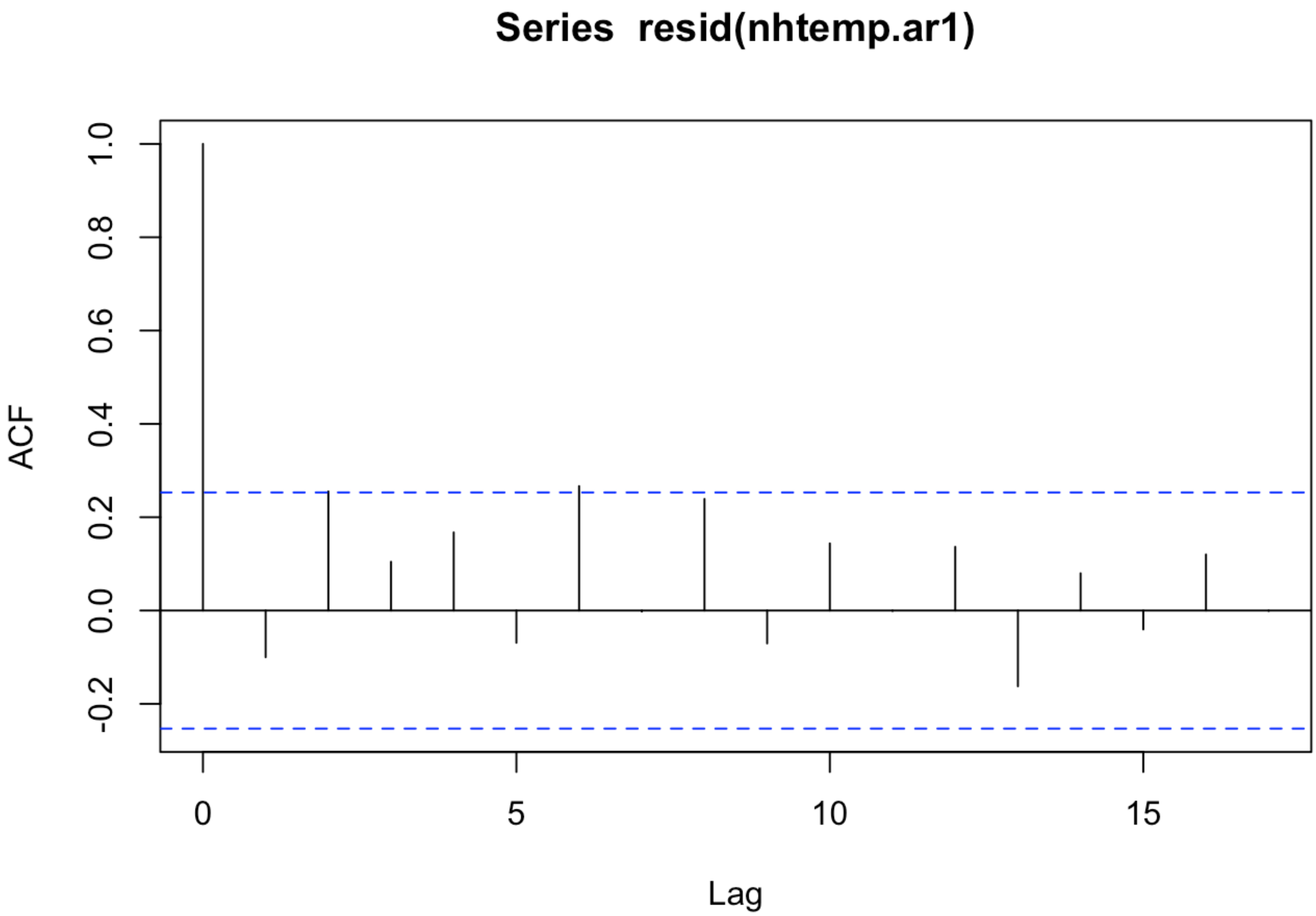

```
acf(resid(nhtemp.ma2))
```



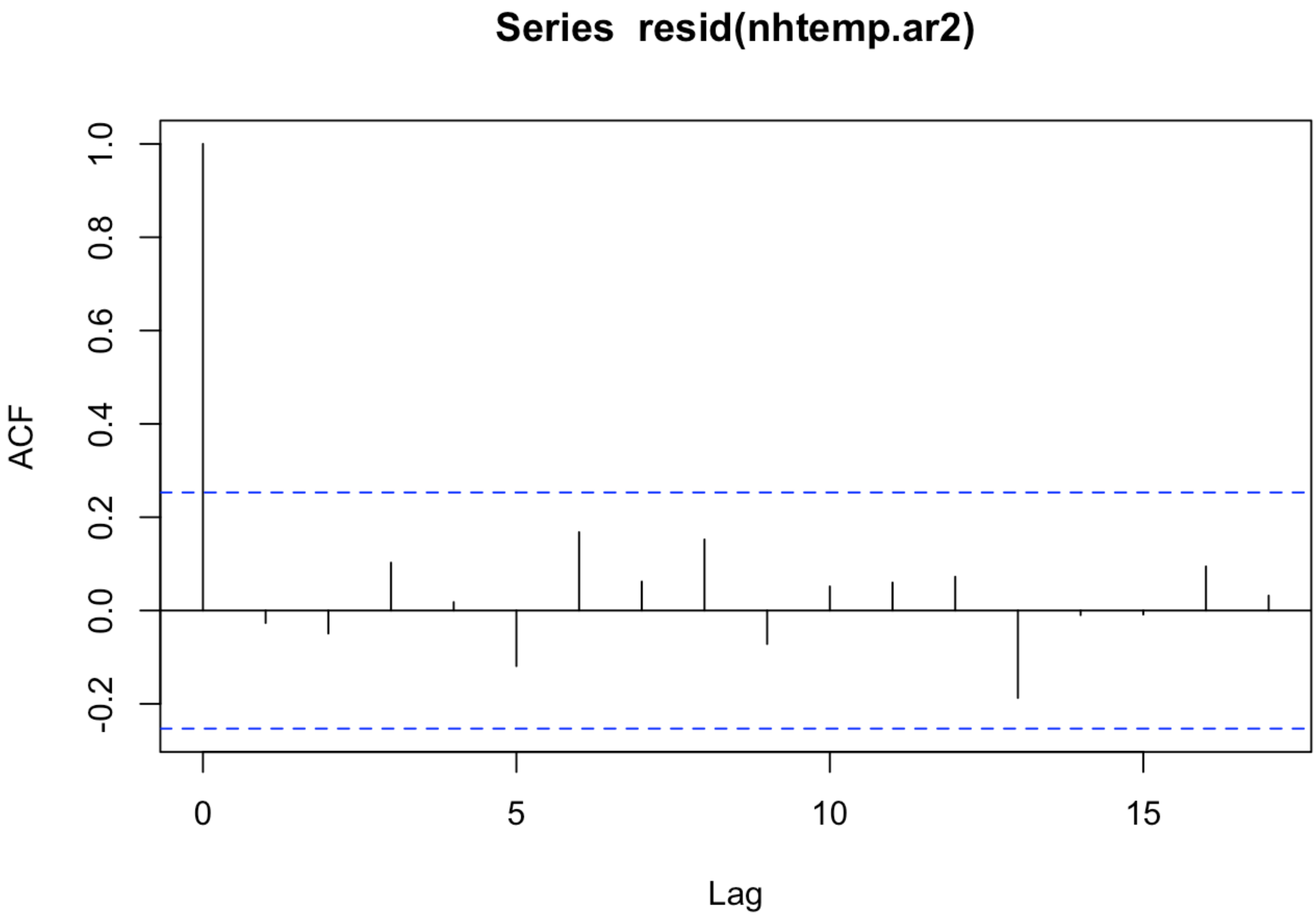

```
acf(resid(nhtemp.ma3))
```



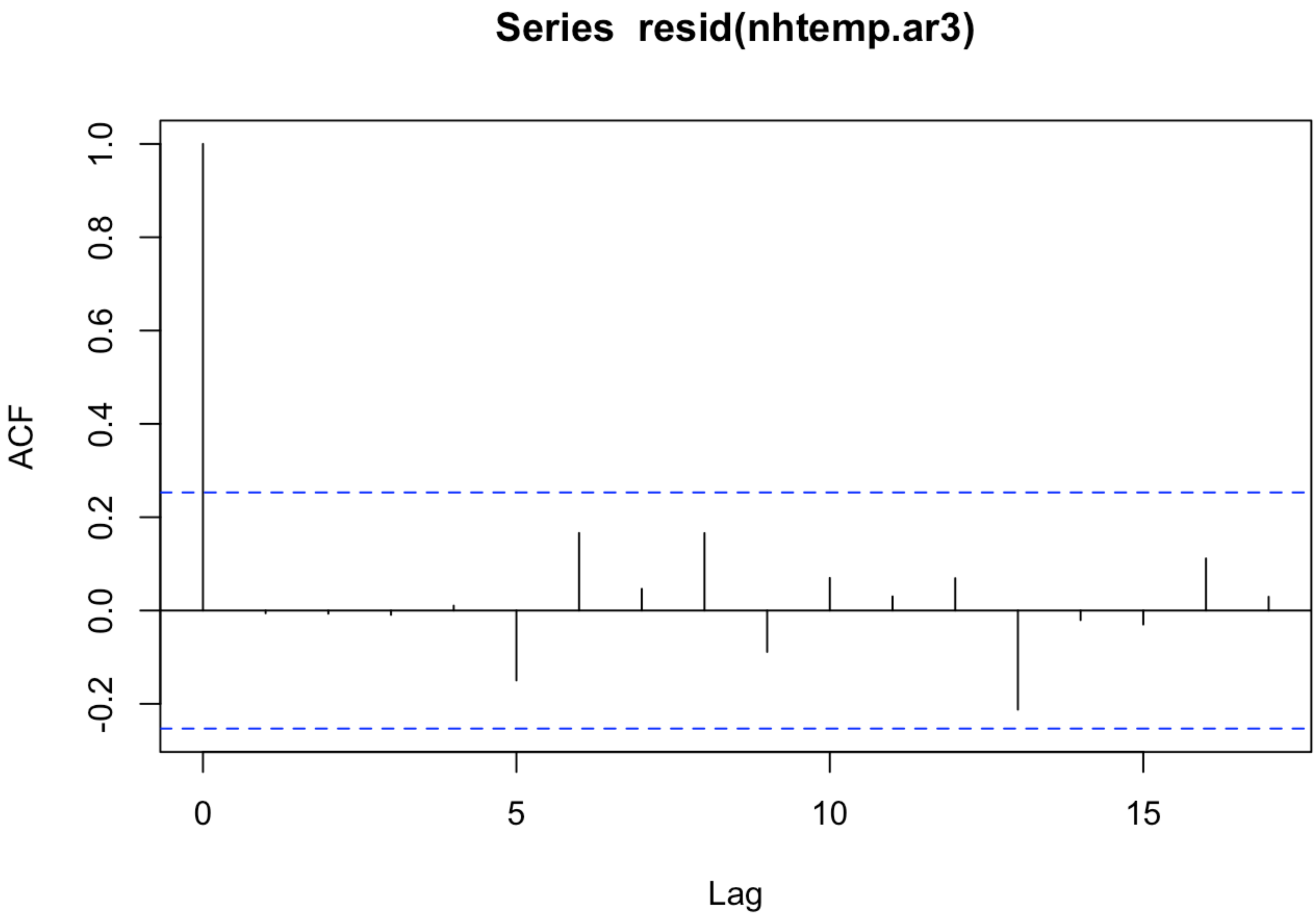

```
acf(resid(nhtemp.ar1))
```




```
acf(resid(nhtemp.ar2))
```




```
acf(resid(nhtemp.ar3))
```



As we see above that the model with the best fit above is white noise.