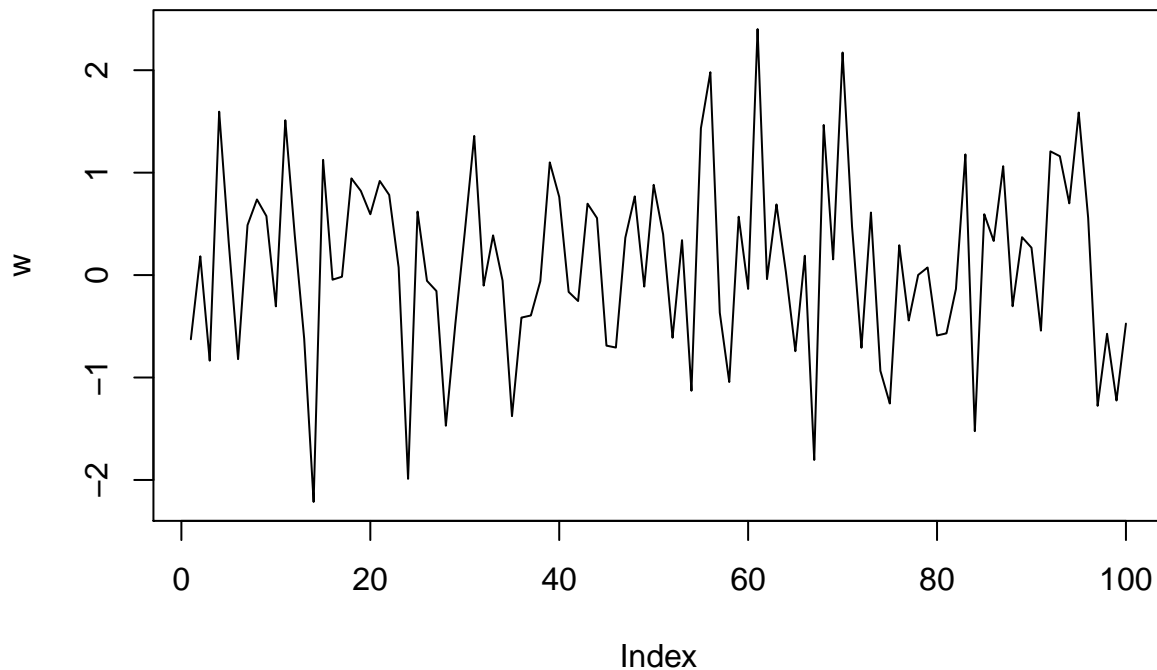


Practice 2 from Introductory Time Series with R

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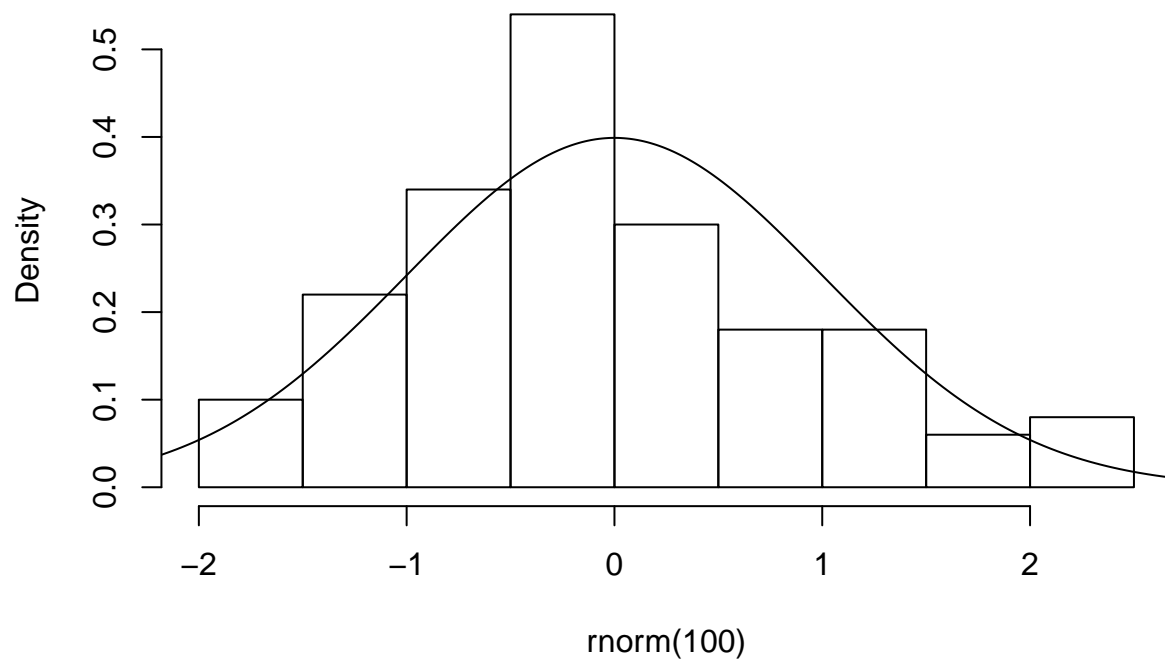
This paper is a practice from the book called **Introductory Time Series with R** by Cowpertwait, Paul SP, and Andrew V. Metcalfe. All R codes and comments below are belonged to the book and authors.

```
set.seed(1)
w <- rnorm(100)
plot(w, type = "l")
```



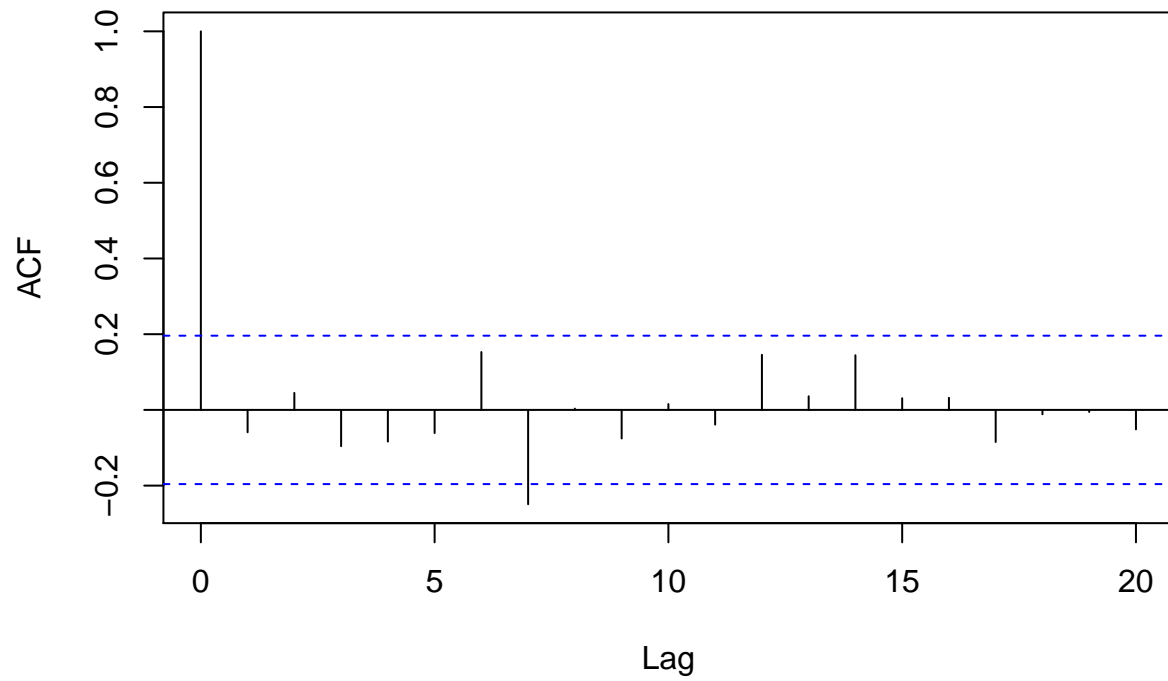
```
x <- seq(-3,3, length = 1000)
hist(rnorm(100), prob = T)
points(x, dnorm(x), type = "l")
```

Histogram of rnorm(100)

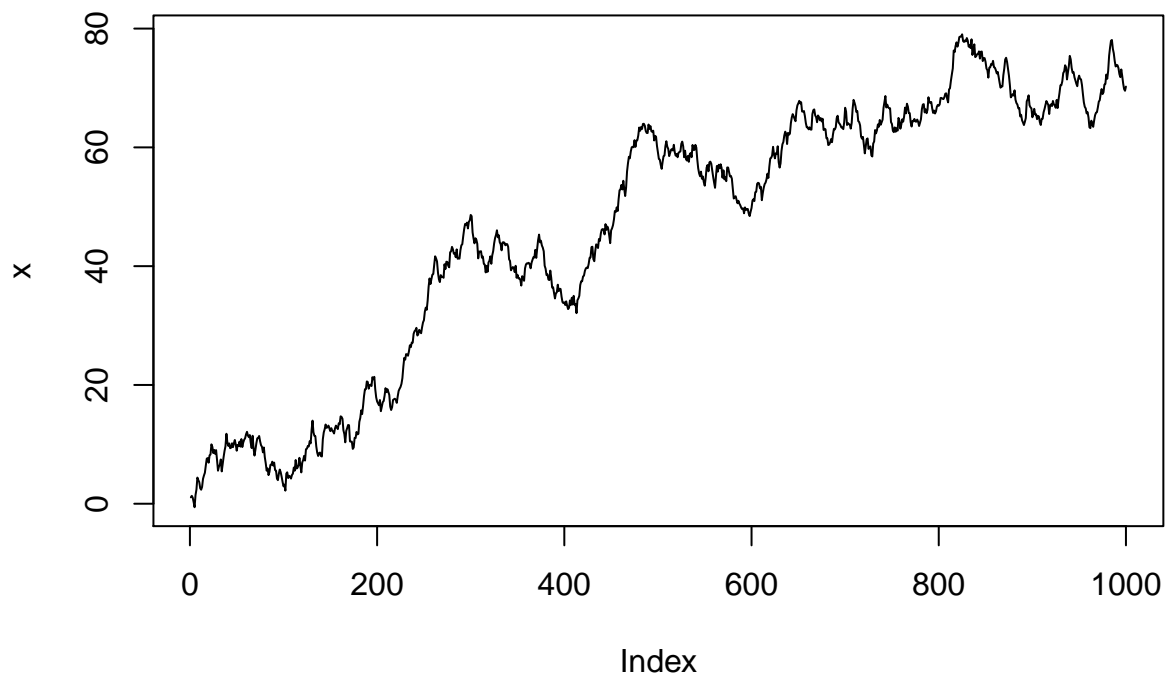


```
set.seed(2)  
acf(rnorm(100))
```

Series rnorm(100)

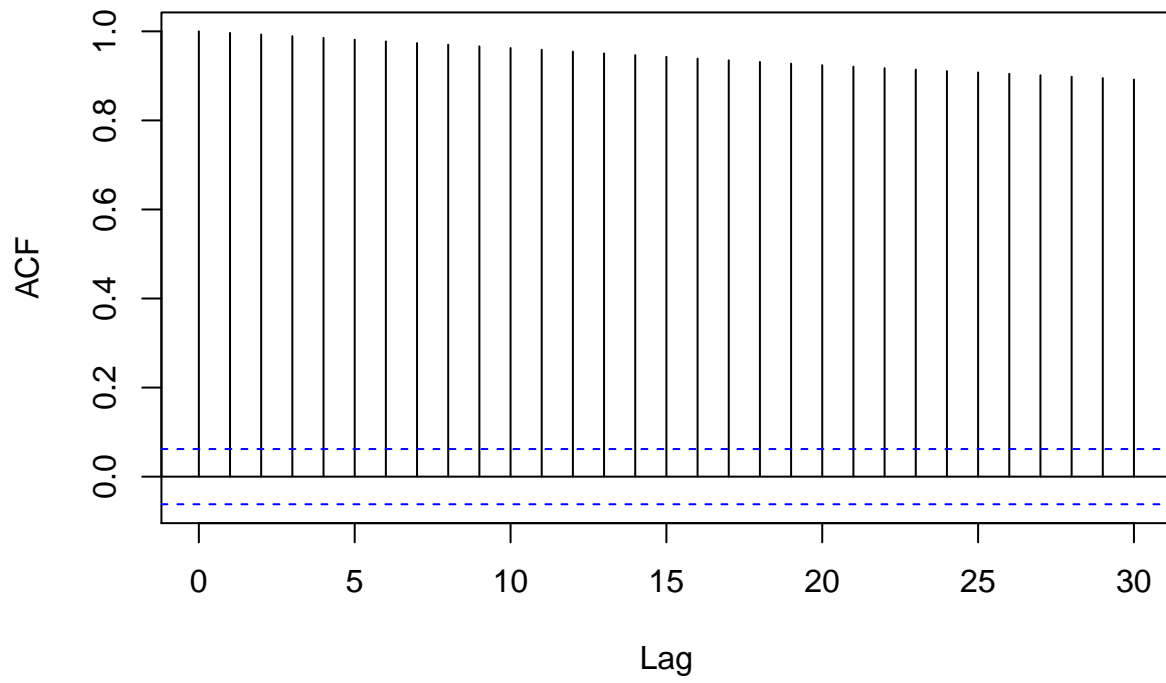


```
x <- w <- rnorm(1000)
for (t in 2:1000) x[t] <- x[t - 1] + w[t]
plot(x, type = "l")
```



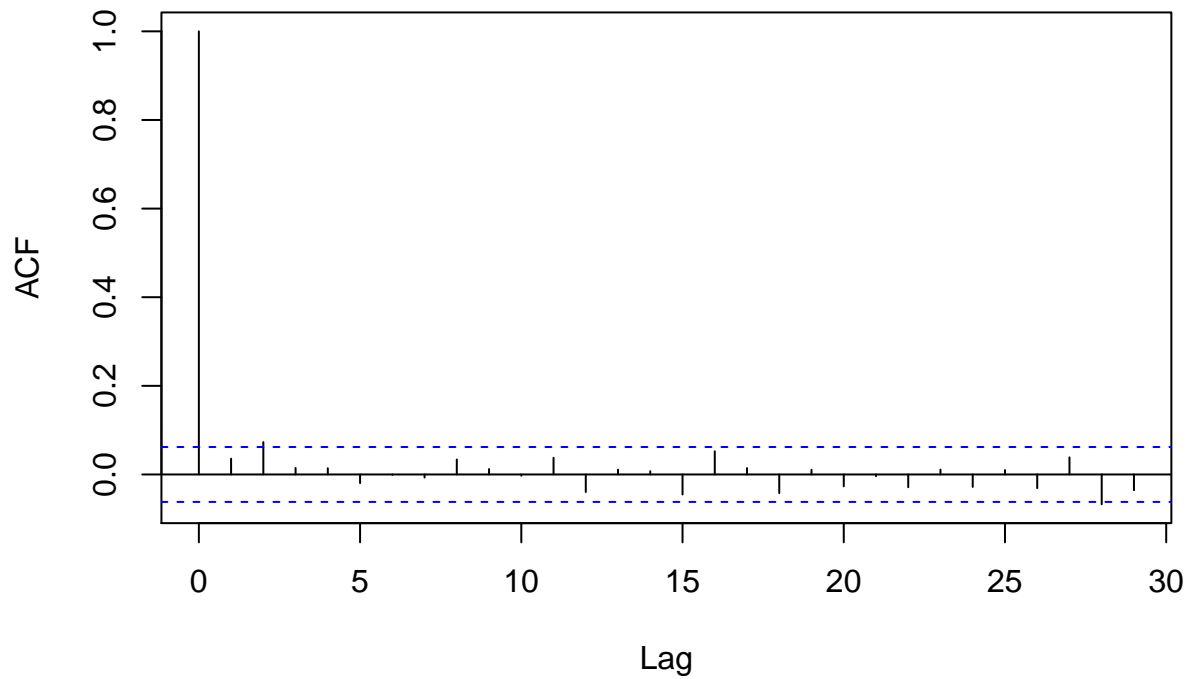
acf(x)

Series x

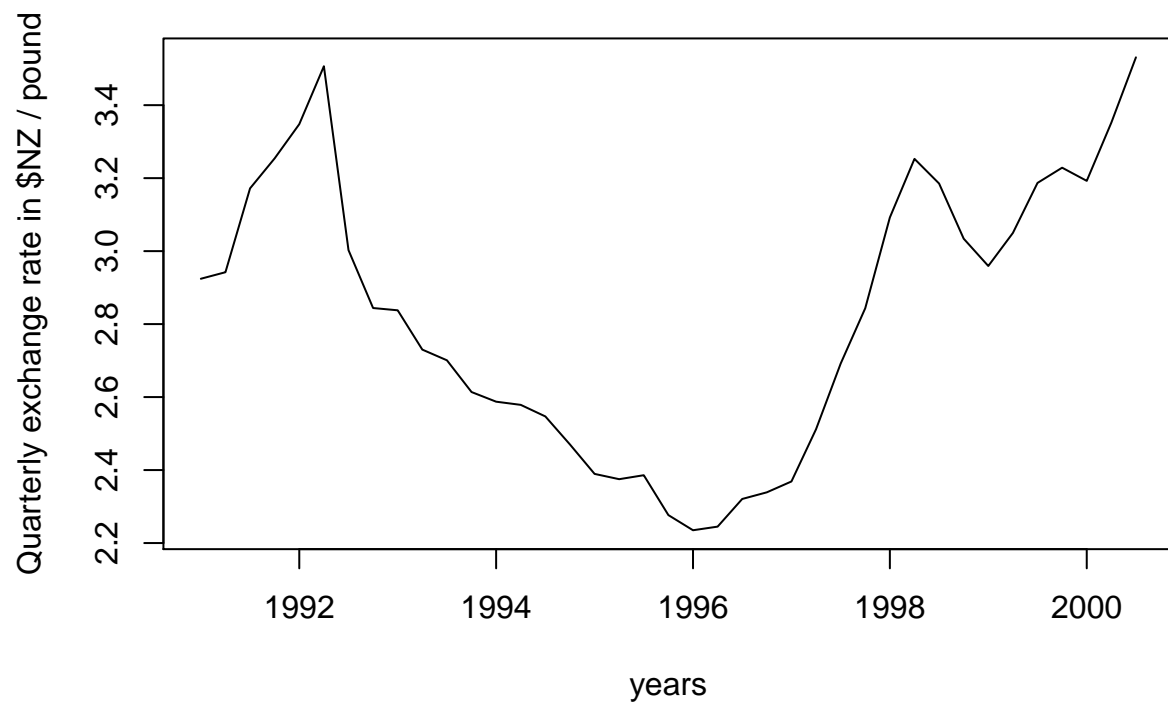


```
acf(diff(x))
```

Series diff(x)

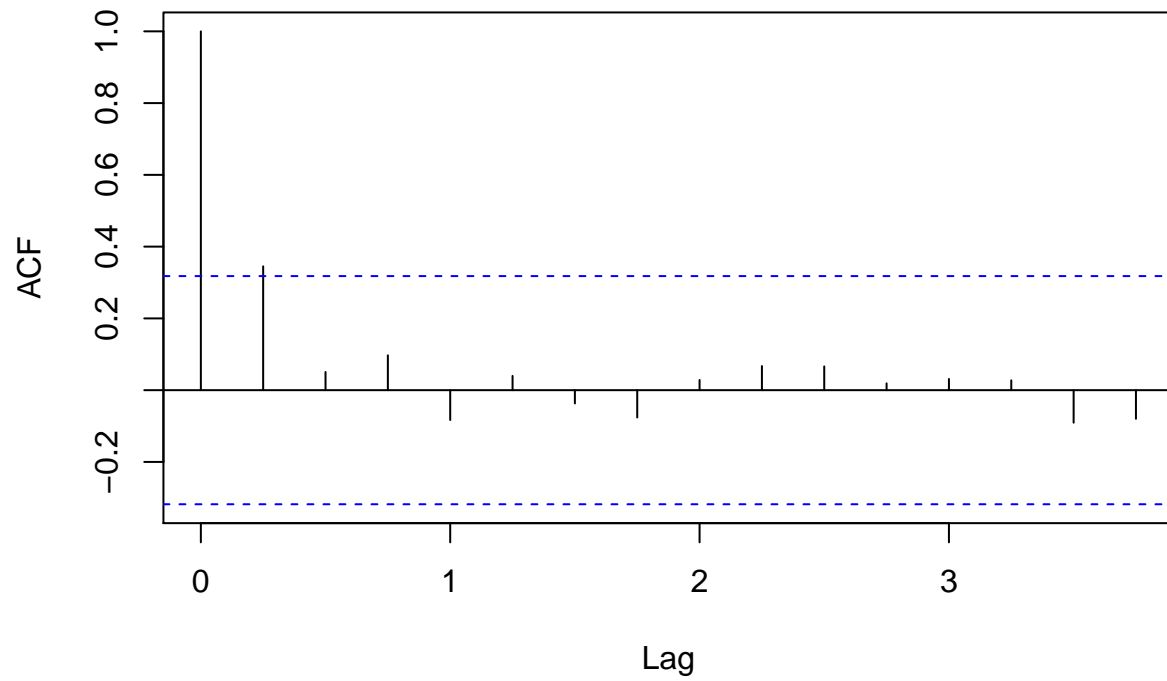


```
www <- "http://staff.elena.aut.ac.nz/Paul-Cowpewartwait/ts/pounds_nz.dat"  
Z <- read.table(www, header = T)  
Z.ts <- ts(Z, st = 1991, fr = 4)  
plot(Z.ts,xlab = "years",ylab = "Quarterly exchange rate in $NZ / pound")
```



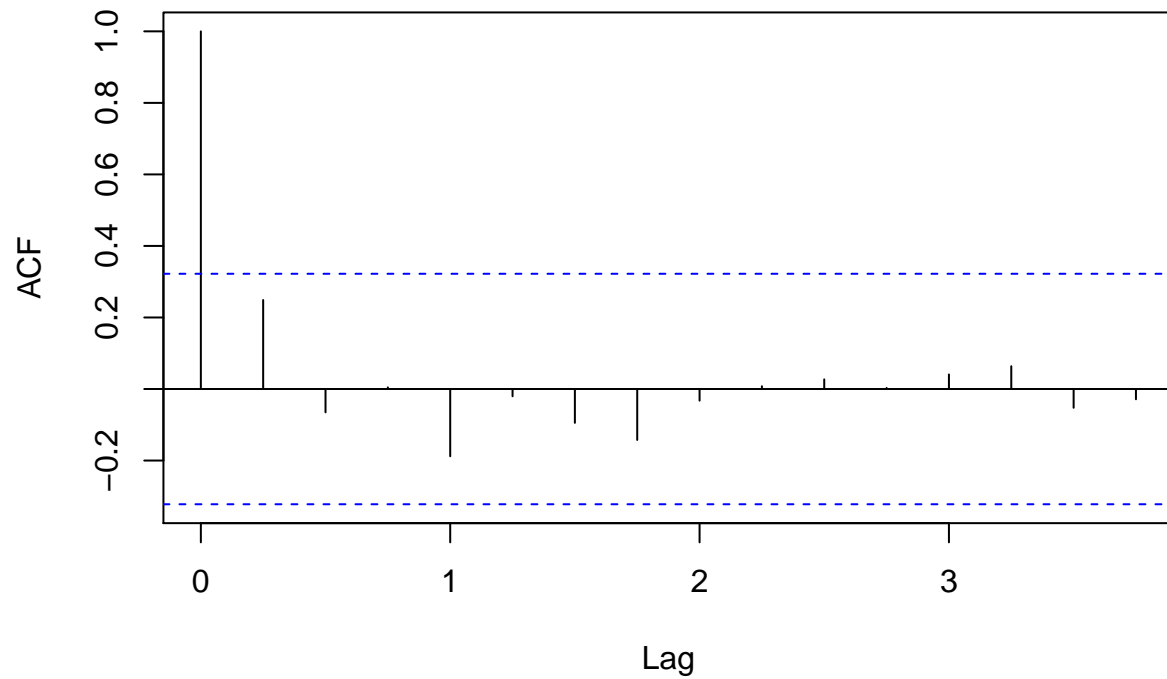
```
acf(diff(Z.ts))
```

xrate



```
Z.hw <- HoltWinters(Z.ts, alpha = 1, gamma = FALSE)  
acf(resid(Z.hw))
```


object\$x



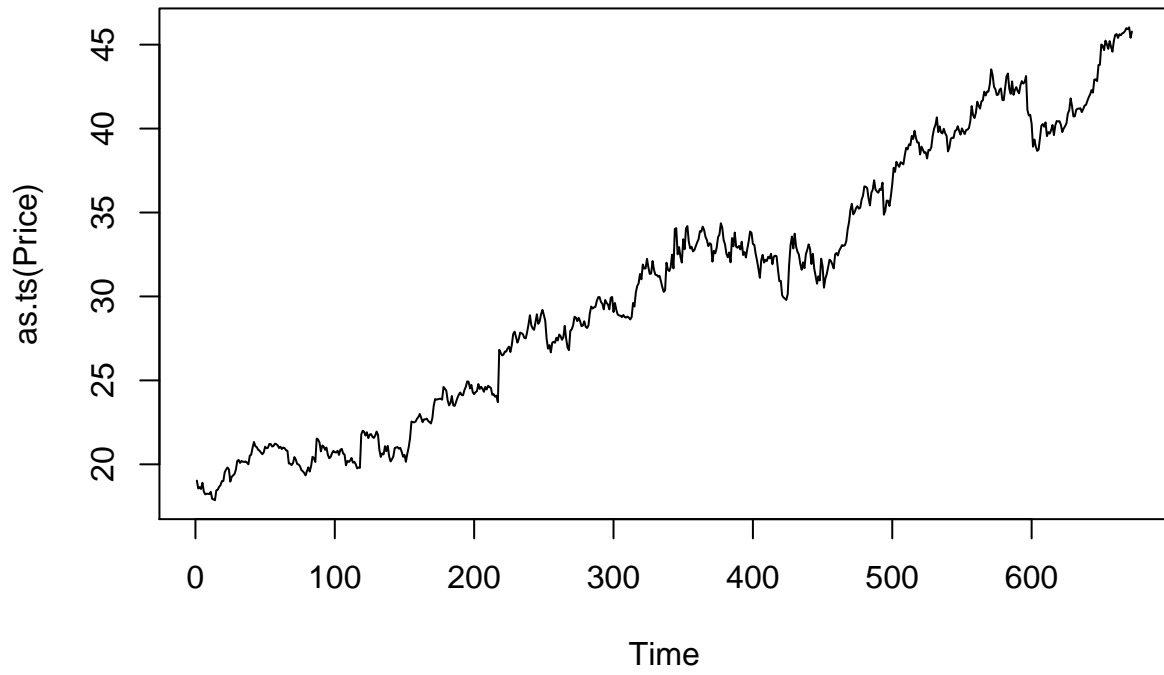
```
Z.hw$alpha
```

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

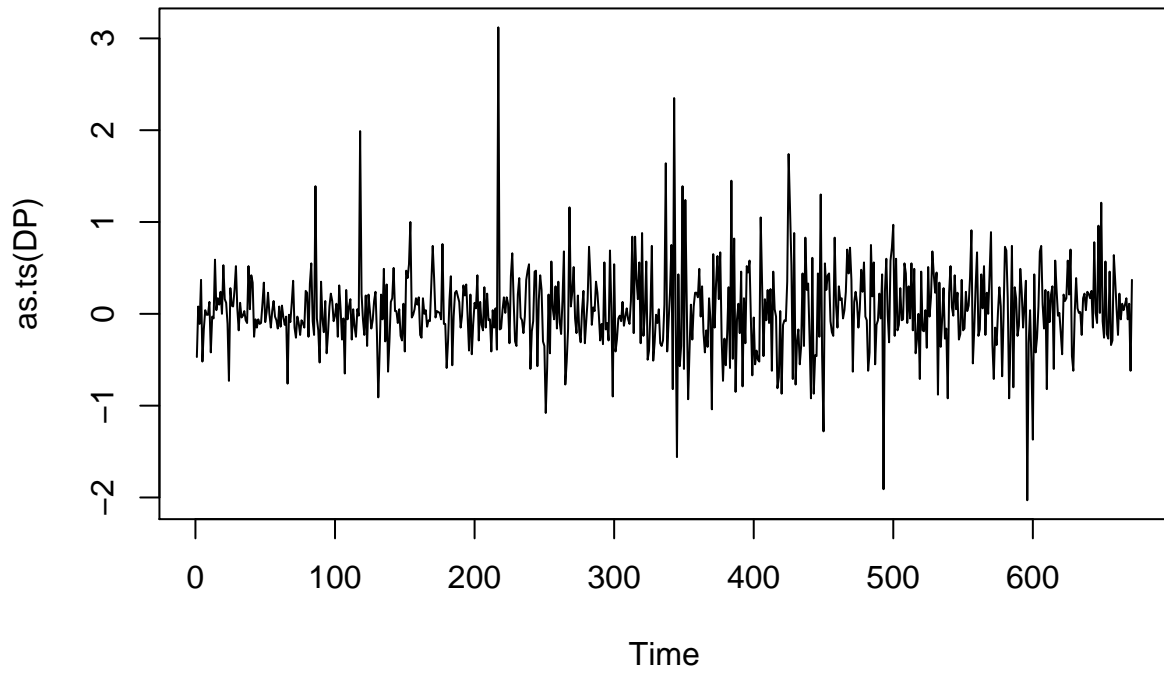
```
Z.hw$beta
```

```
## [1] 0.167018
```

```
www <- "http://staff.elena.aut.ac.nz/Paul-Cowpervait/ts/HP.txt"  
HP.dat <- read.table(www, header = T) ; attach(HP.dat)  
plot(as.ts(Price))
```

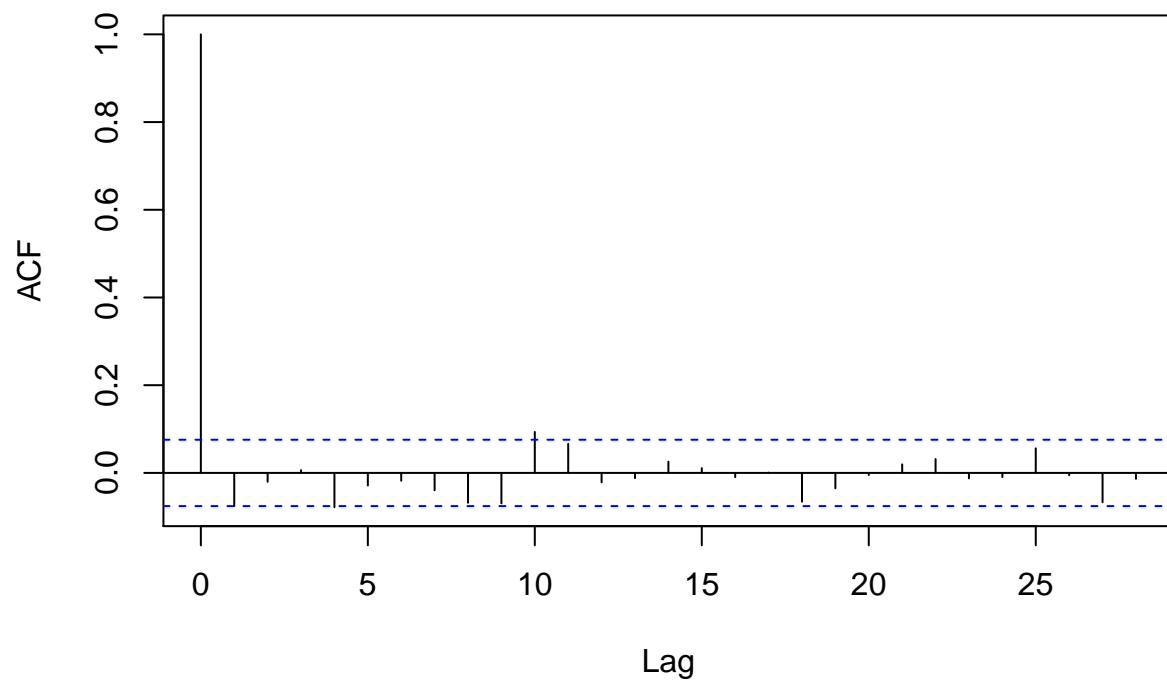


```
DP <- diff(Price)
plot (as.ts(DP))
```



acf (DP)

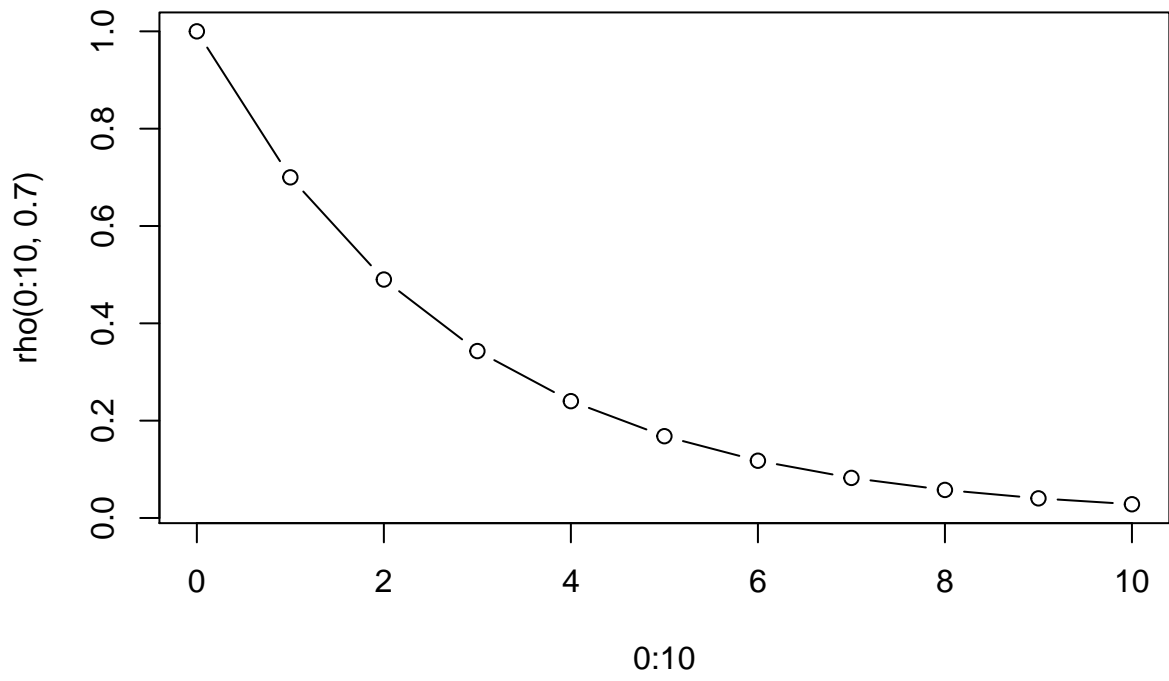
Series DP



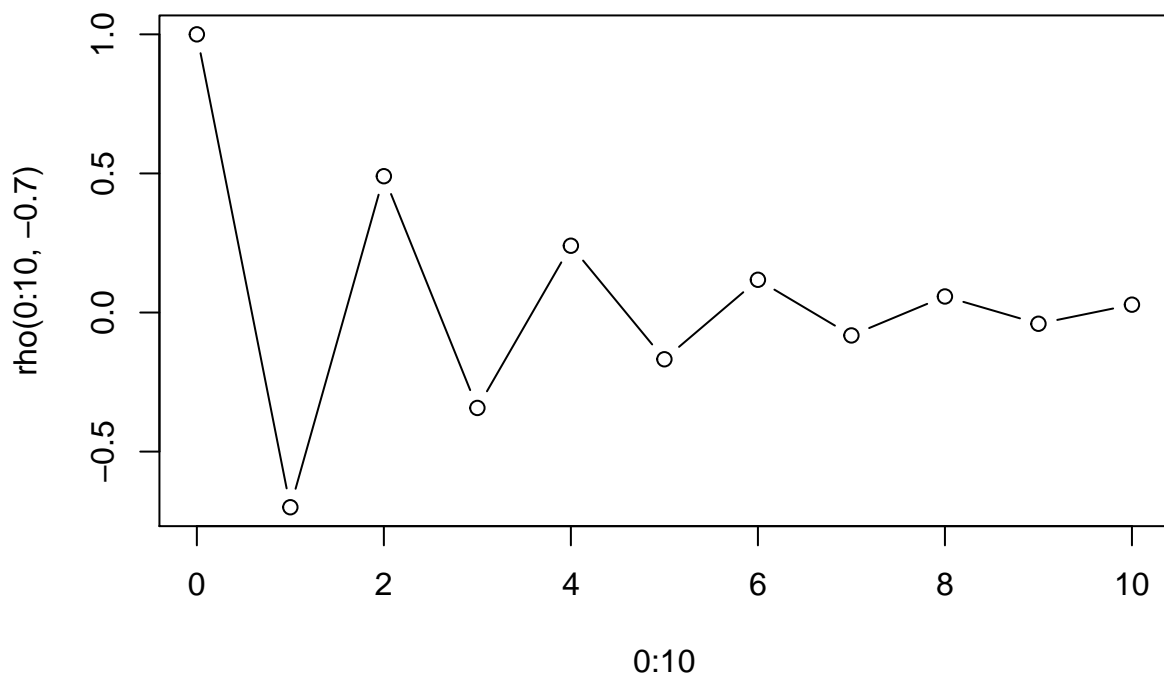
```
mean(DP) + c(-2, 2) * sd(DP)/sqrt(length(DP))
```

```
## [1] 0.004378275 0.075353468
```

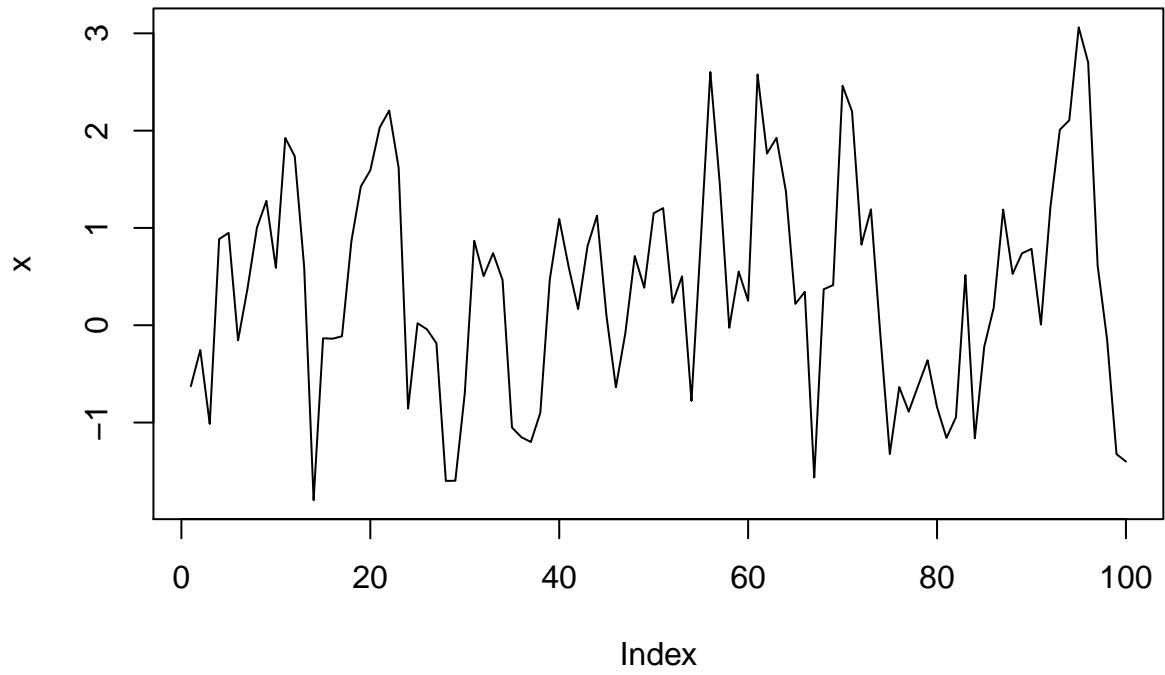
```
rho <- function(k, alpha) alpha^k  
plot(0:10, rho(0:10, 0.7), type = "b")
```



```
plot(0:10, rho(0:10, -0.7), type = "b")
```

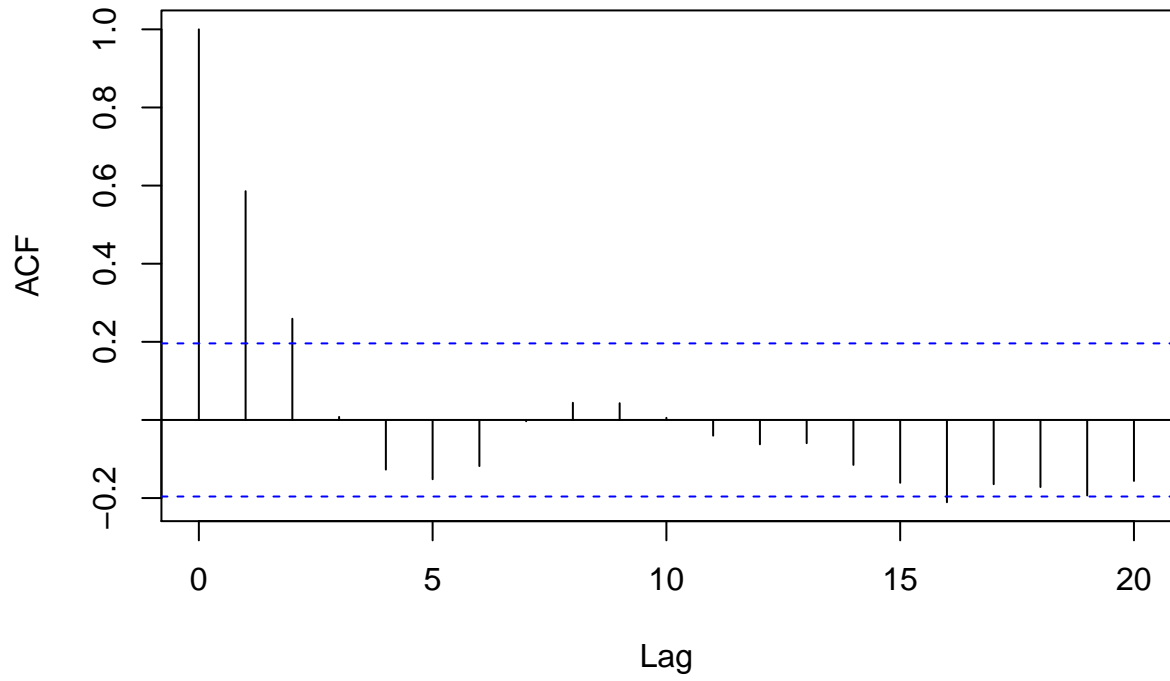


```
set.seed(1)
x <- w <- rnorm(100)
for (t in 2:100) x[t] <- 0.7 * x[t - 1] + w[t]
plot(x, type = "l")
```



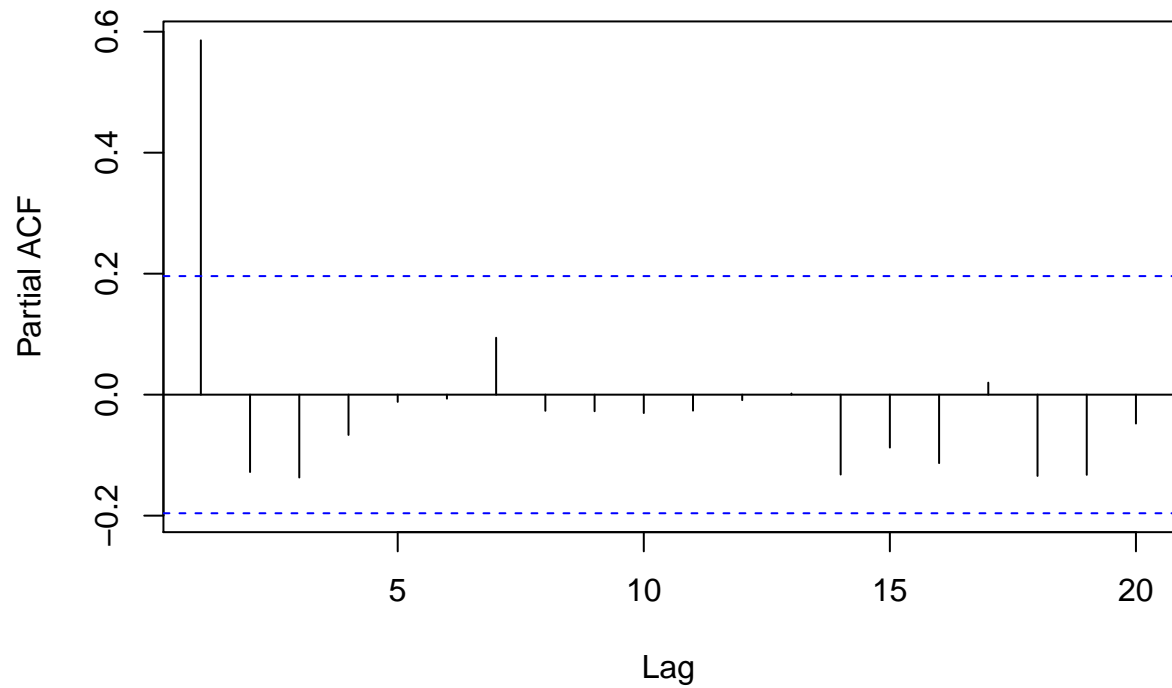
acf(x)

Series x



`pacf(x)`

Series x



```
x.ar <- ar(x, method = "mle")  
x.ar$order
```

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

```
x.ar$ar
```

```
## [1] 0.6009459
```

```
x.ar$ar + c(-2, 2) * sqrt(x.ar$asy.var)
```

```
## [1] 0.4404031 0.7614886
```

```
Z.ar <- ar(Z.ts)  
mean(Z.ts)
```

```
## [1] 2.823251
```

```
Z.ar$order
```

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

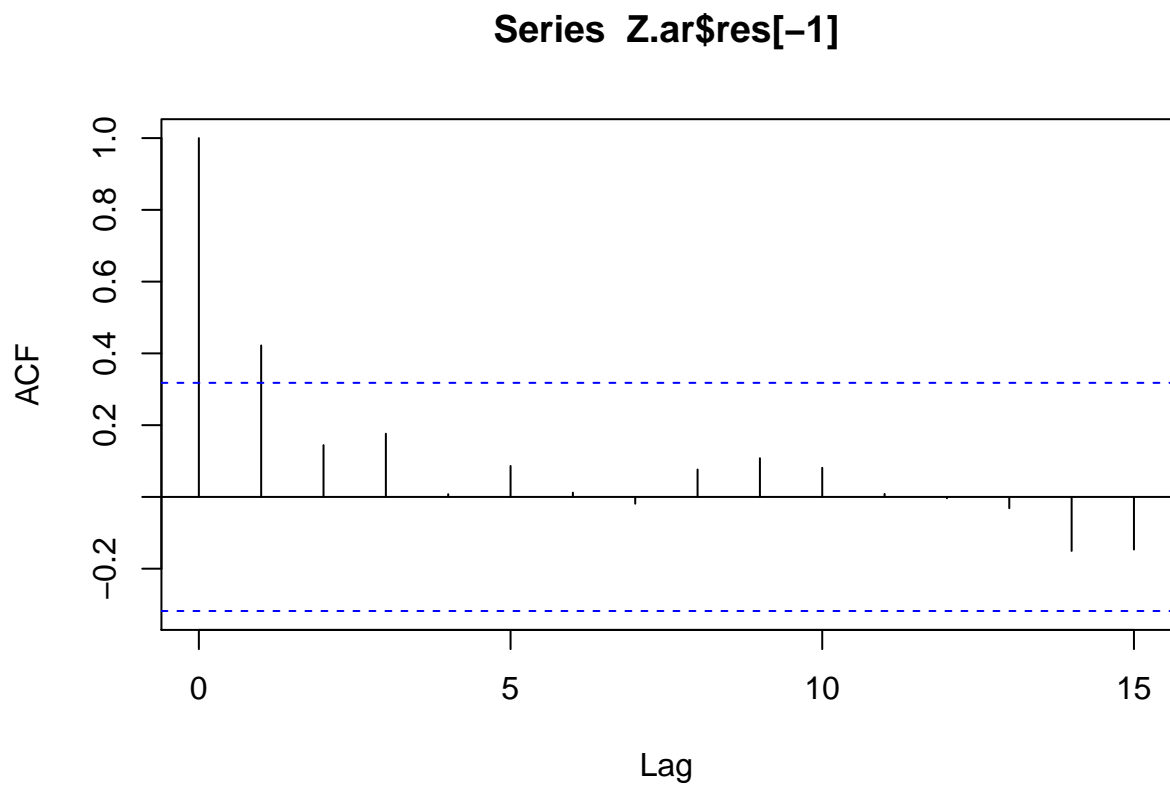
```
Z.ar$ar
```

```
## [1] 0.890261
```

```
Z.ar$ar + c(-2, 2) * sqrt(Z.ar$asy.var)
```

```
## [1] 0.7405097 1.0400123
```

```
acf(Z.ar$res[-1])
```



Reference:

Cowpertwait, Paul SP, and Andrew V. Metcalfe. *Introductory time series with R*. Springer Science & Business Media, 2009.