

STAT4870 Chapter 4 (2)

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Section 4.1

```
library("astsa")  
library("xts")
```

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

```
##
```

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

```
## The following objects are masked from 'package:base':
```

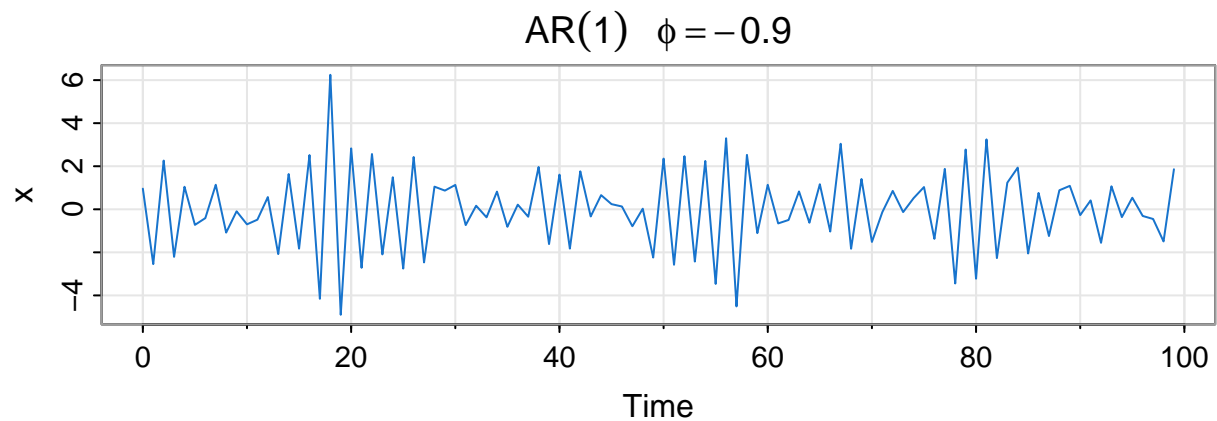
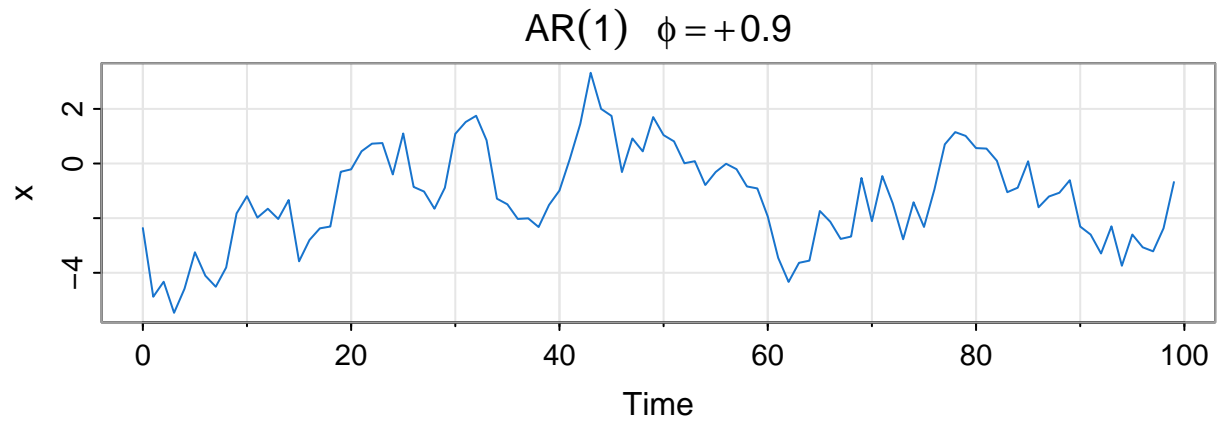
```
##
```

```
##      as.Date, as.Date.numeric
```

```
op<-par(mfrow=c(2,1))
```

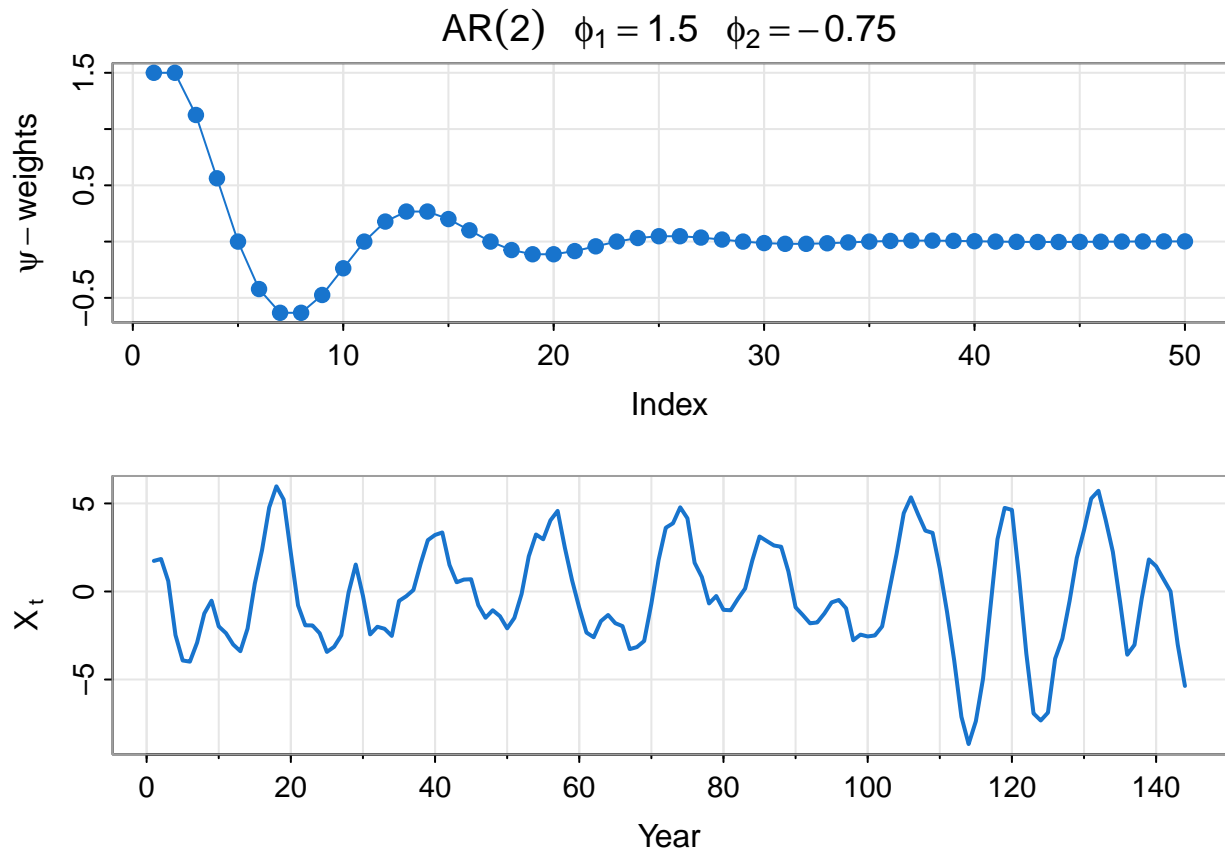
```
tsplot(sarima.sim(ar= .9, n=100), ylab="x", col=4, main=expression(AR(1)~--phi==+.9))
```

```
tsplot(sarima.sim(ar=-.9, n=100), ylab="x", col=4, main=expression(AR(1)~--phi==-.9))
```

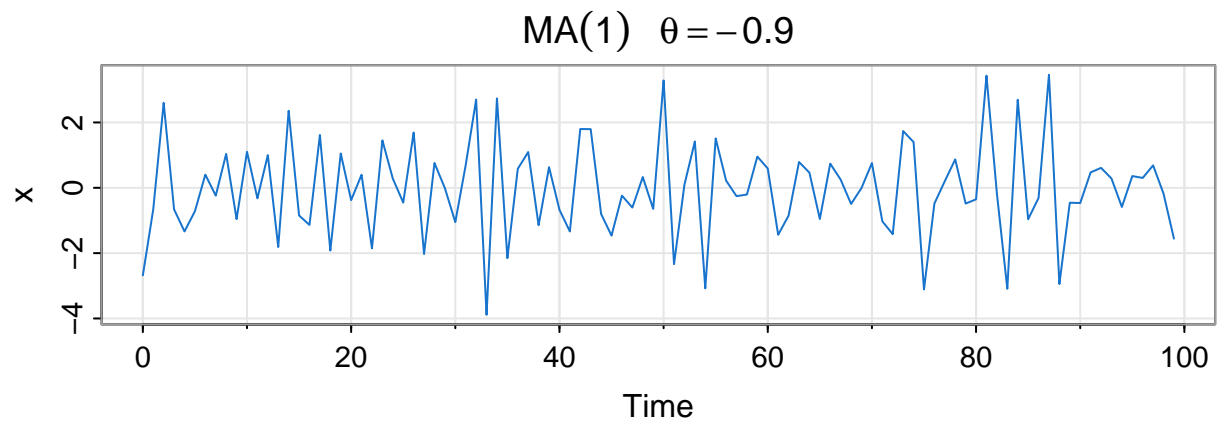
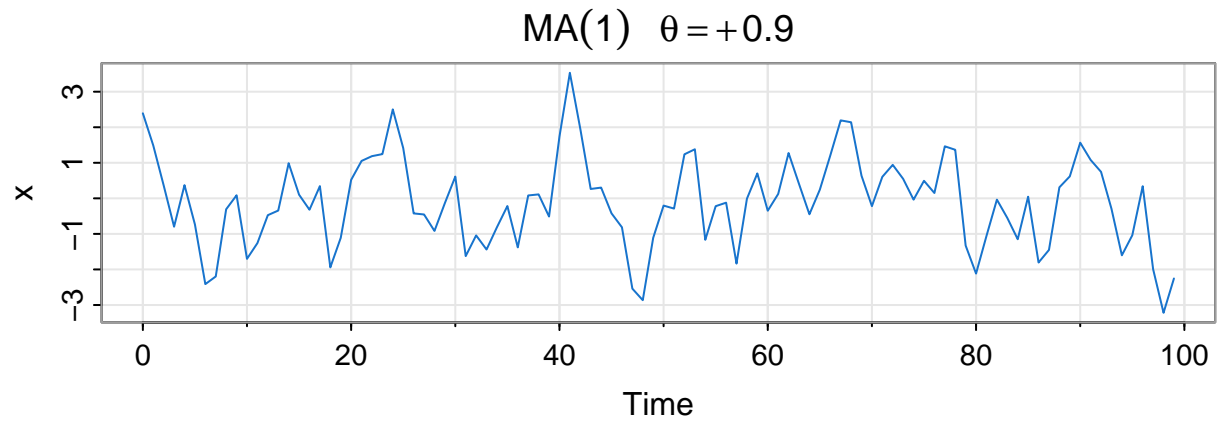


```
par(op)
```

```
psi <- ARMAtoMA(ar = c(1.5, -.75), ma = 0, 50)
op<-par(mfrow=c(2,1))
tsplot(psi, col=4, type='o', pch=19, ylab=expression(psi-weights), xlab='Index',
main=expression(AR(2)~~~phi[1]==1.5~~~phi[2]==-.75))
set.seed(8675309)
simulation <- arima.sim(list(order=c(2,0,0),ar=c(1.5,-.75)), n=144)
tsplot(simulation, ylab=expression(X[~t]), col=4, xlab='Year', lwd=2)
```



```
op<-par(mfrow = c(2,1))
tsplot(sarima.sim(ma= .9, n=100), col=4, ylab="x", main=expression(MA(1)~~~theta==+.9))
tsplot(sarima.sim(ma=-.9, n=100), col=4, ylab="x", main=expression(MA(1)~~~theta==-.9))
```



```
par(op)
```

```
set.seed(8675309)
x <- rnorm(150, mean=5)
arima(x, order=c(1,0,1))
```

```
##
## Call:
## arima(x = x, order = c(1, 0, 1))
##
## Coefficients:
##          ar1      ma1  intercept
##       -0.9595  0.9527    5.0462
## s.e.    0.1688  0.1750    0.0727
##
## sigma^2 estimated as 0.7986:  log likelihood = -195.98,  aic = 399.96
```

```
AR <- c(1, -.3, -.4)
polyroot(AR)
```

```
## [1] 1.25-0i -2.00+0i
```

```
MA <- c(1, .5)
polyroot(MA)
```

```
## [1] -2+0i
```

```
round( ARMAtoMA(ar=.8, ma=-.5, 10), 2)
```

```
## [1] 0.30 0.24 0.19 0.15 0.12 0.10 0.08 0.06 0.05 0.04
```

```
round( ARMAtoAR(ar=.8, ma=-.5, 10), 2)
```

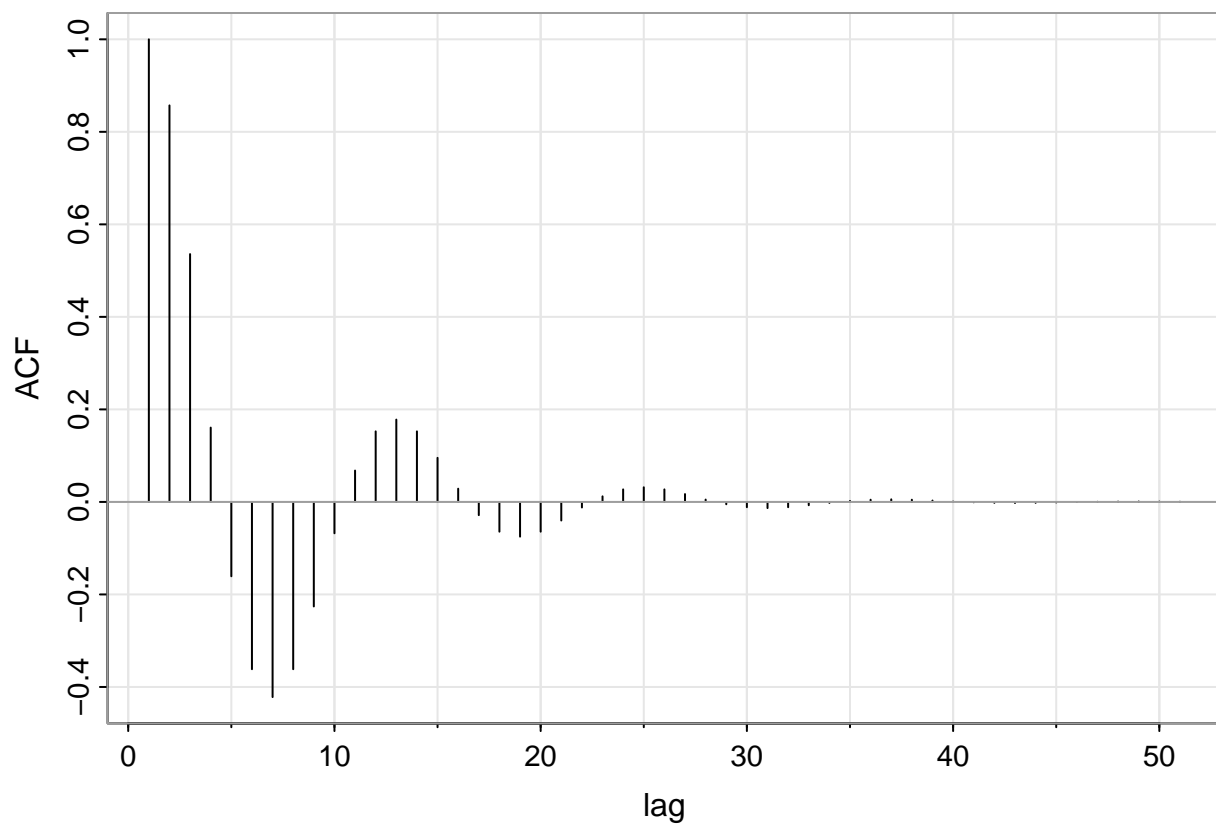
```
## [1] -0.30 -0.15 -0.08 -0.04 -0.02 -0.01 0.00 0.00 0.00 0.00
```

```
ARMAtoMA(ar=1, ma=0, 20)
```

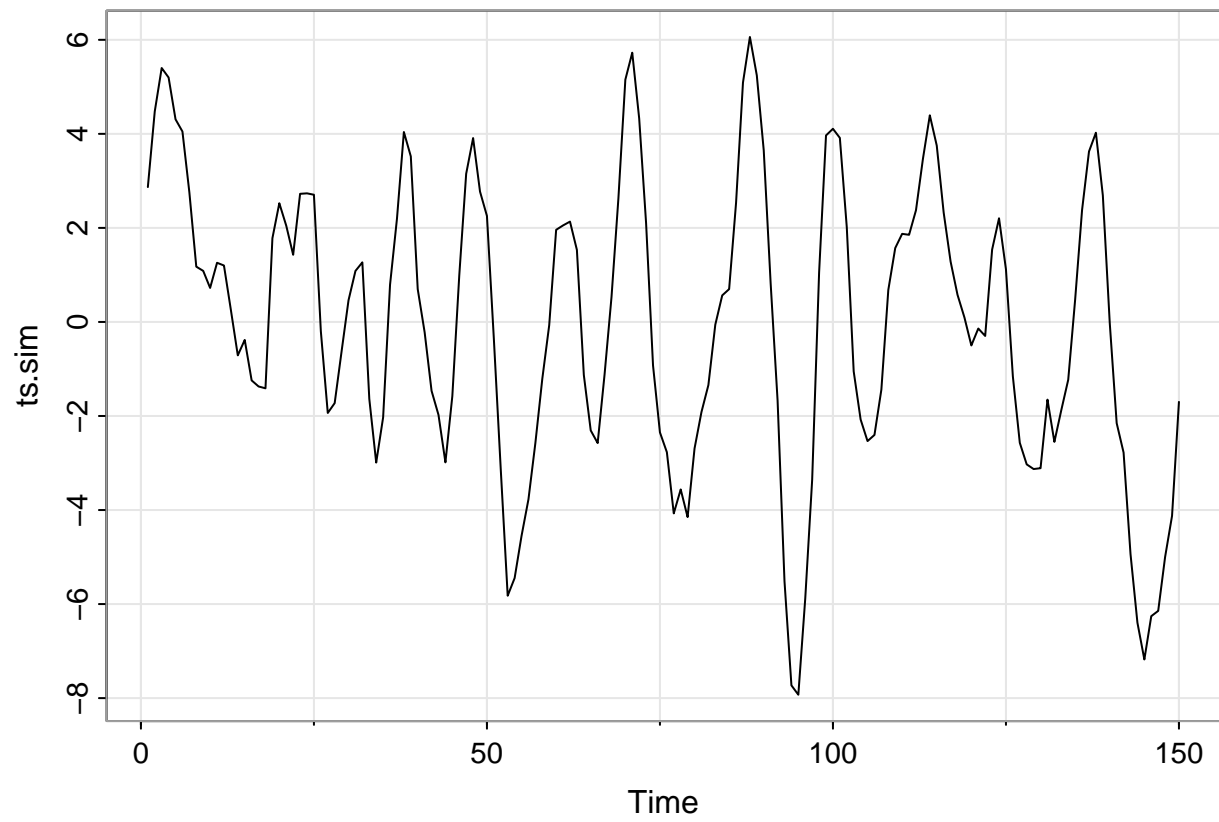
```
## [1] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

Section 4.2

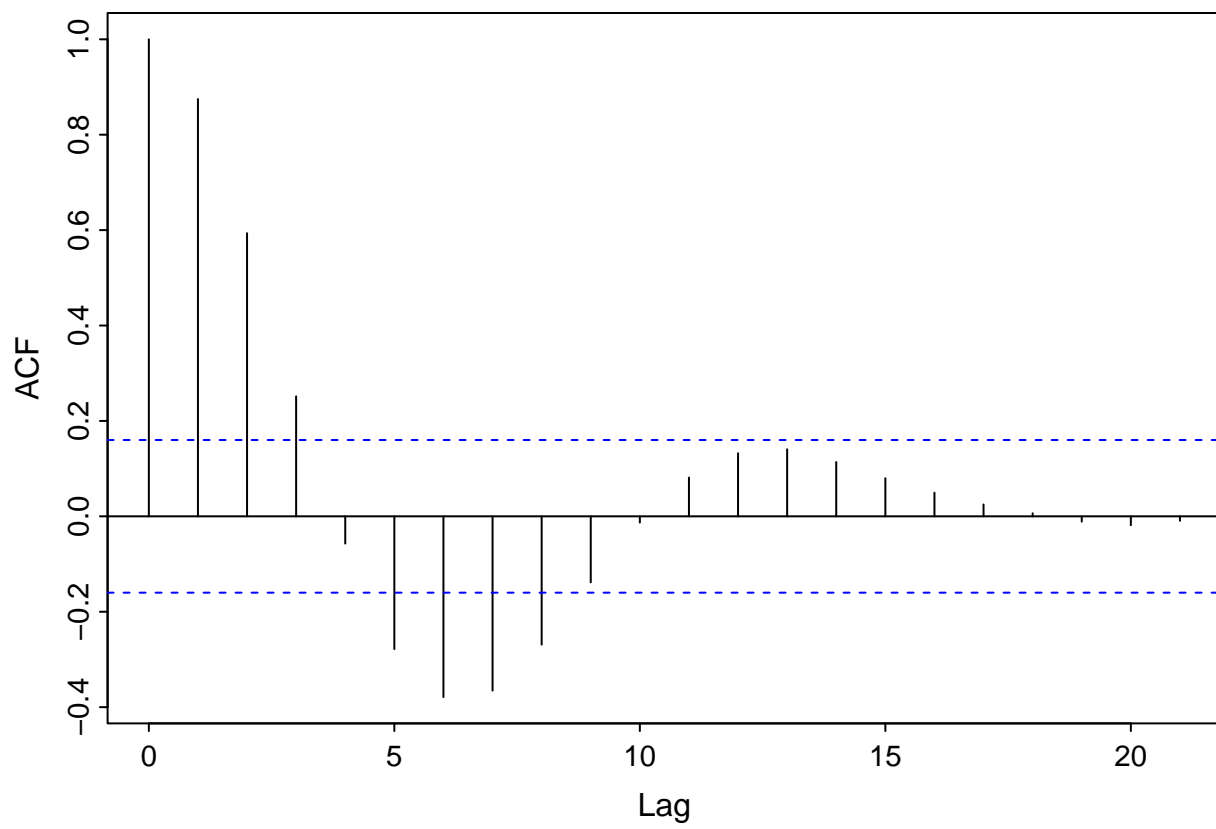
```
ACF <- ARMAacf(ar=c(1.5,-.75), ma=0, 50)
tsplot(ACF, type="h", xlab="lag")
abline(h=0, col=8)
```



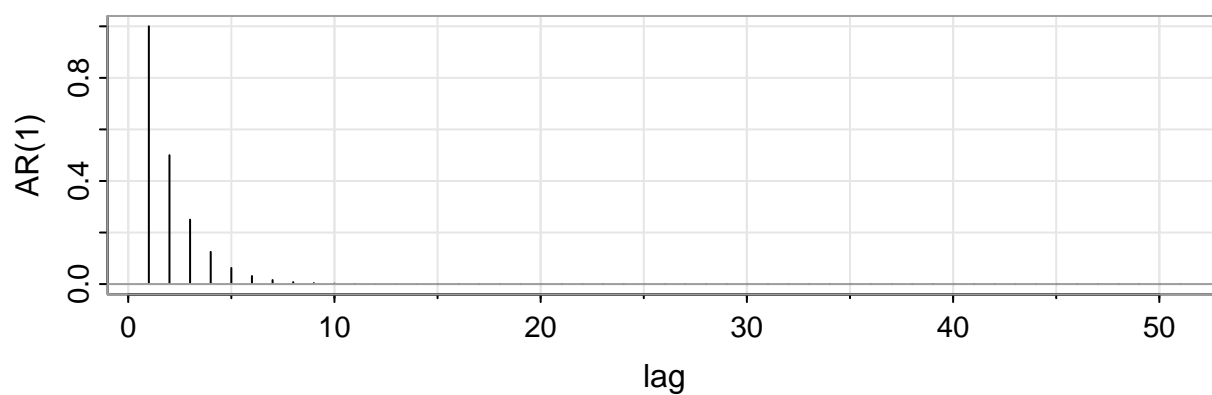
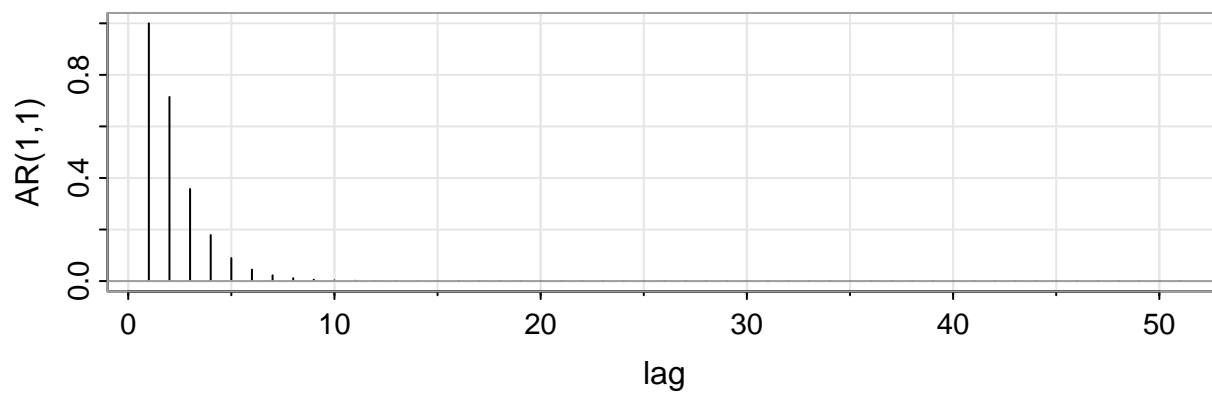
```
ts.sim <- arima.sim(list(order = c(2,0,0), ar = c(1.5,-.75)), n = 150)
tsplot(ts.sim)
```



```
acf(ts.sim)
```

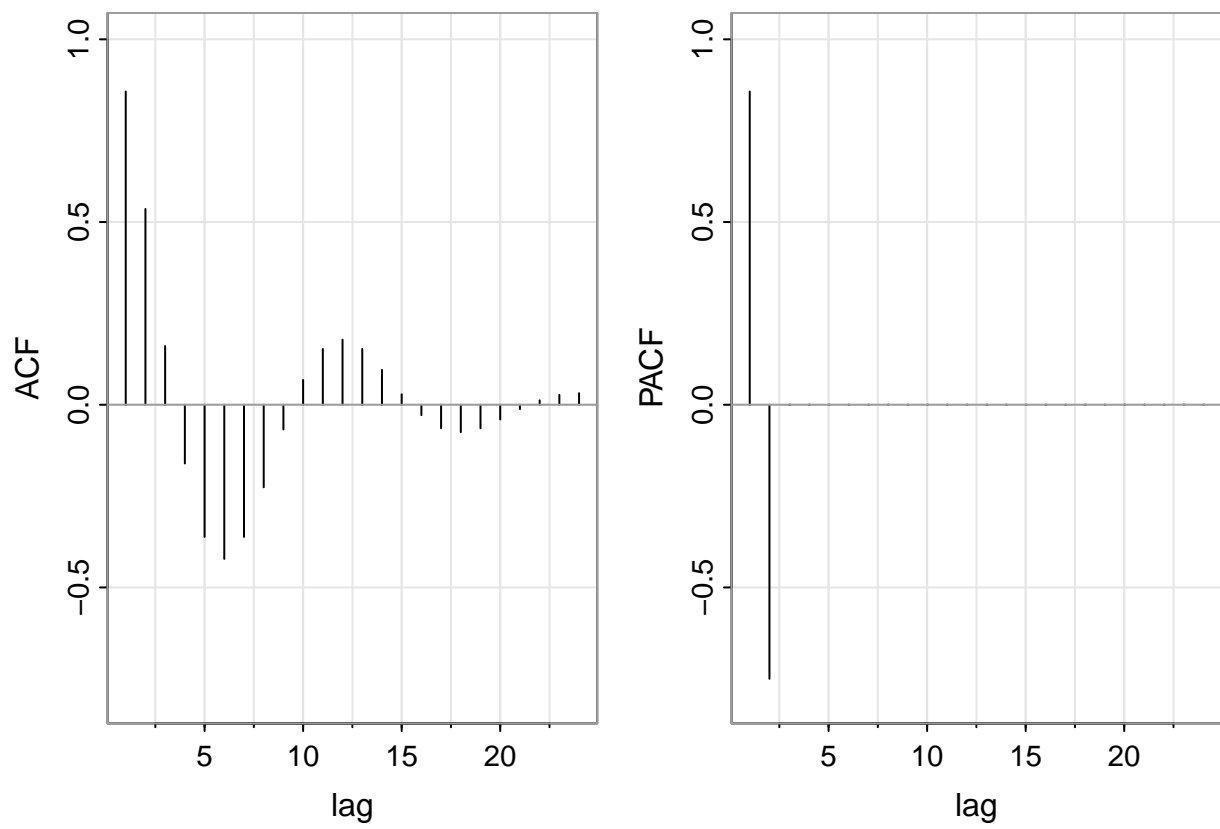


```
ACF.arma11 <- ARMAacf(ar=0.5, ma=0.5, 50)
ACF.arma10 <- ARMAacf(ar=0.5, ma=0, 50)
op<-par(mfrow=c(2,1))
tsplot(ACF.arma11, type="h", xlab="lag", ylab="AR(1,1)")
abline(h=0, col=8)
tsplot(ACF.arma10, type="h", xlab="lag", ylab="AR(1)")
abline(h=0, col=8)
```

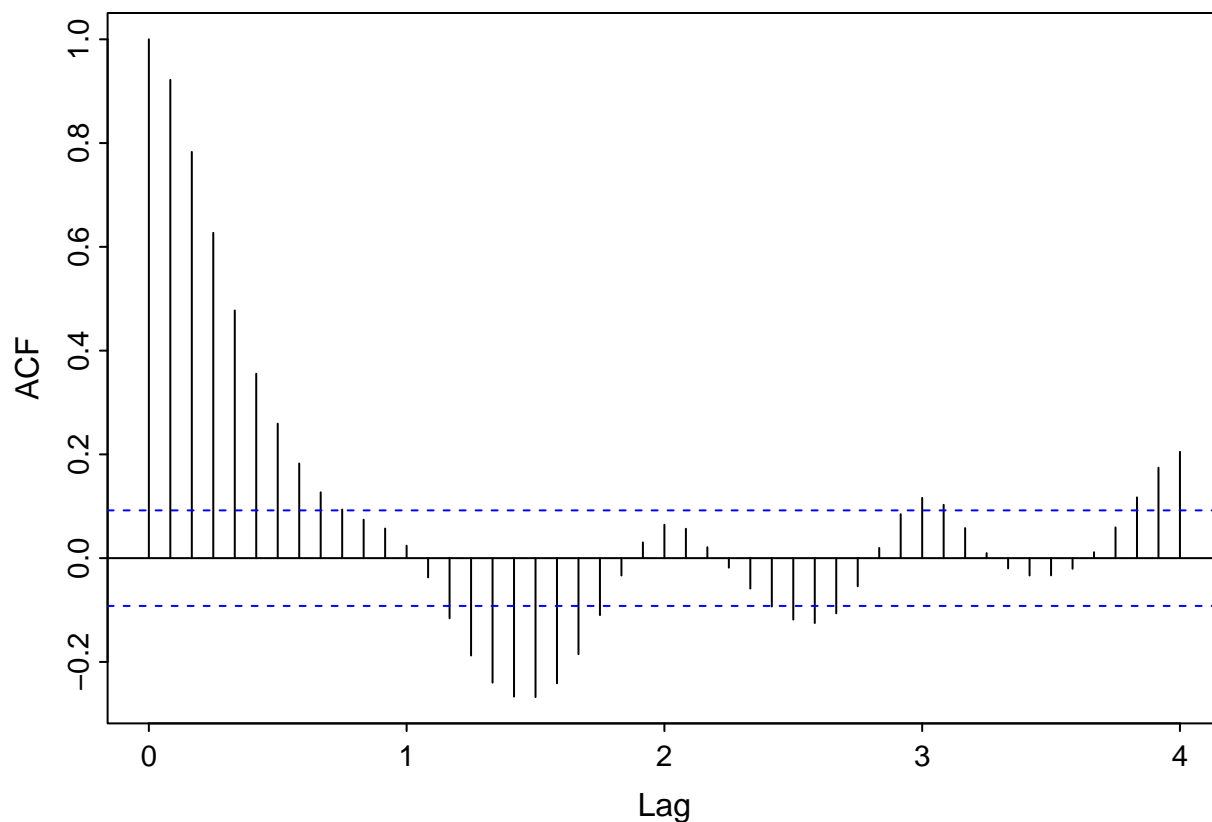


```
par(op)

ACF <- ARMAacf(ar=c(1.5,-.75), ma=0, 24)
ACF <- ARMAacf(ar=c(1.5,-.75), ma=0, 24)[-1]
PACF <- ARMAacf(ar=c(1.5,-.75), ma=0, 24, pacf=TRUE)
op<-par(mfrow=1:2)
tsplot(ACF, type="h", xlab="lag", ylim=c(-.8,1))
abline(h=0, col=8)
tsplot(PACF, type="h", xlab="lag", ylim=c(-.8,1))
abline(h=0, col=8)
```

```
par(op)
acf(rec, 48)
```



```
(regr <- ar.ols(rec, order=2, demean=FALSE, intercept=TRUE))
```

```
##
## Call:
## ar.ols(x = rec, order.max = 2, demean = FALSE, intercept = TRUE)
##
## Coefficients:
##      1      2
## 1.3541 -0.4632
##
## Intercept: 6.737 (1.111)
##
## Order selected 2  sigma^2 estimated as  89.72
```

```
(regr <- ar.ols(rec, order=2, demean=TRUE, intercept=FALSE))
```

```
##
## Call:
## ar.ols(x = rec, order.max = 2, demean = TRUE, intercept = FALSE)
##
## Coefficients:
##      1      2
## 1.3541 -0.4632
##
## Order selected 2  sigma^2 estimated as  89.72
```