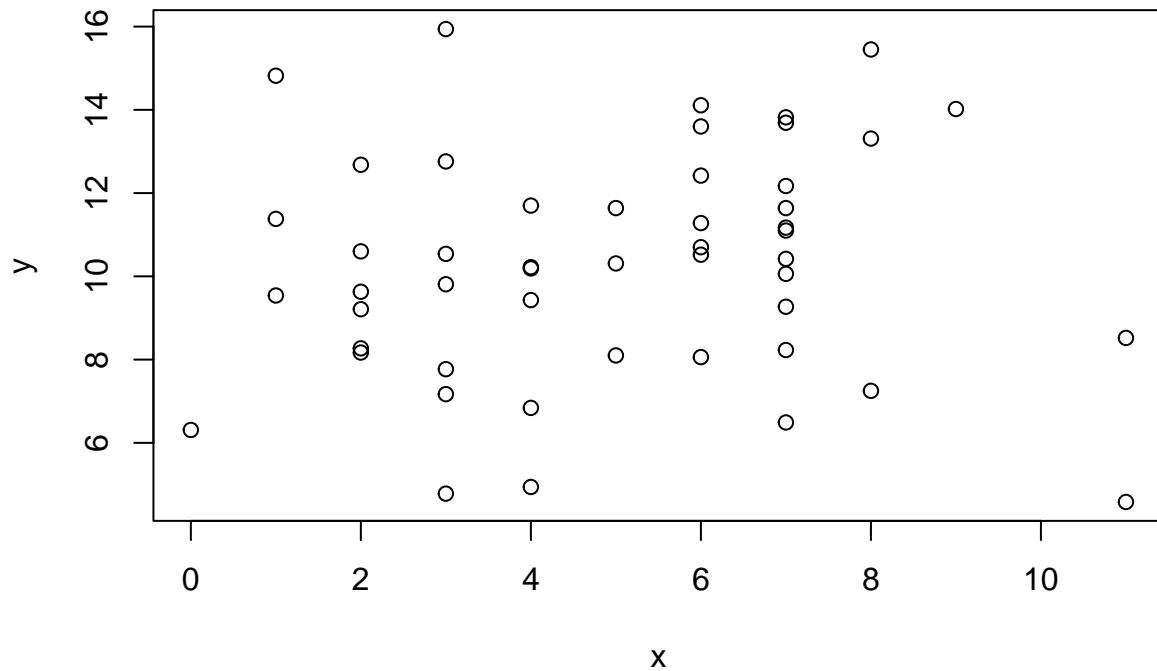


MS Assignment

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```
x=c(7, 3, 4, 11, 2, 7, 0, 2, 8, 1, 2, 4, 7, 6, 4, 7, 4, 3, 6, 3, 2, 6, 6, 1, 3, 7, 2,3, 1, 3, 8, 7, 5, 3)
y=c(10.06, 12.76, 4.94, 8.52, 8.17, 13.82, 6.31, 8.27, 15.45, 9.54, 12.68, 6.84, 8.23, 11.28, 10.19, 13.82, 10.06, 12.76, 4.94, 8.52, 8.17, 13.82, 6.31, 8.27, 15.45, 9.54, 12.68, 6.84, 8.23, 11.28, 10.19, 13.82)
plot(x,y)
```



```
fit=lm(y~x)
summary(fit)
```

```
##
## Call:
## lm(formula = y ~ x)
##
## Residuals:
```

```
## -6.2421 -2.1109 0.0146 1.6482 5.8216
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  9.85454    0.85689  11.500 2.15e-15 ***
## x            0.08796    0.15306   0.575  0.568
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.768 on 48 degrees of freedom
## Multiple R-squared:  0.006834, Adjusted R-squared: -0.01386
## F-statistic: 0.3303 on 1 and 48 DF, p-value: 0.5682
```

```
res=residuals(fit)
sum(res^2)/48
```

```
## [1] 7.660693
```

```
library(invgamma)
```

```
sim<-function(a,b,c,d,e,f,x,y,alpha0,beta0,sig0)
```

```
{
  n=length(x)
  X=matrix(rep(0,3000),1000,3)
  colnames(X)=c("alpha","beta","sigma")

  X[1,]=c(alpha0,beta0,sig0)

  for(i in 2:1000)
  {
    X[i,1]=rnorm(1,(b*sum(y)-b*X[i-1,2]*sum(x)+a*X[i-1,3])/(X[i-1,3]+n*b),sqrt((b*X[i-1,3])/(X[i-1,3]+n*b)))
    X[i,2]=rnorm(1,(d*sum(x*y)-X[i,1]*d*sum(x)+X[i-1,3]*c)/(d*sum(x^2)+X[i-1,3]),sqrt((X[i-1,3]*d)/(d*sum(x^2)+X[i-1,3])))
    X[i,3]=rinvgamma(1,(n/2)+e,(sum((y-X[i,1]-X[i,2]*x)^2)+2*f)/2)
  }
  return(X)
}
```

```
z=sim(9.85,0.73,0.09,0.02,10,69,x,y,9,0.05,8)
```

```
#end
```

```
m=cbind(mean(z[,1]),mean(z[,2]),mean(z[,3]))
```

```
##Trying different initial settings
```

```
z_1=sim(9.85,0.73,0.09,0.02,10,69,x,y,9.5,0.06,8.5)
```

```
m_1=cbind(mean(z_1[,1]),mean(z_1[,2]),mean(z_1[,3]))
```

```
z_2=sim(9.85,0.73,0.09,0.02,10,69,x,y,10,0.07,9)
```

```
m_2=cbind(mean(z_2[,1]),mean(z_2[,2]),mean(z_2[,3]))
```

```
matrix(c(m,m_1,m_2),3,3,byrow = TRUE)
```

```
##           [,1]      [,2]      [,3]
```

```
## [1,] 9.863159 0.08516049 7.575421
```

```
## [2,] 9.852169 0.08912501 7.573768
```

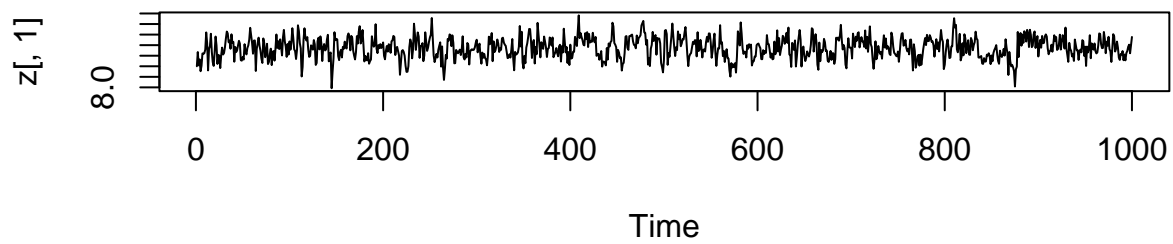
```
## [3,] 9.845941 0.09077151 7.630497
```

```
## Plot the marginal distribution of alpha,beta and sigma
```

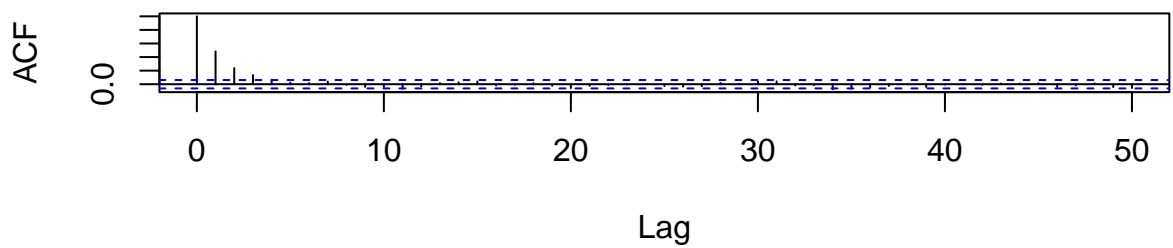
```
par(mfrow=c(2,1))
```

```
ts.plot(z[,1])
```

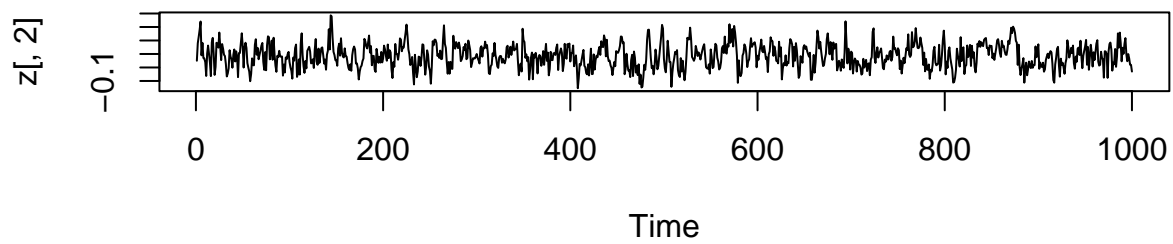
```
acf(z[,1],lag=50)
```



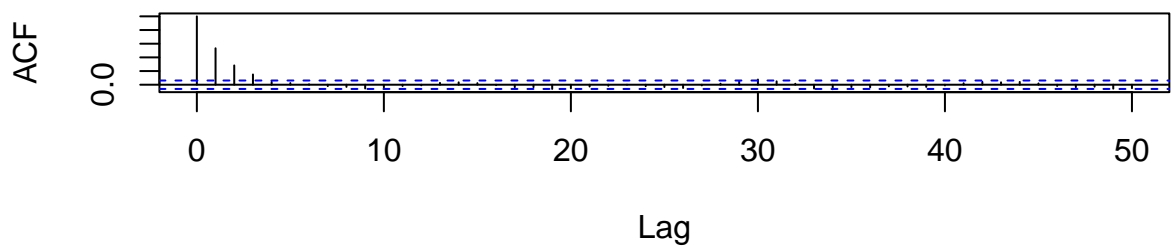
Series $z[, 1]$



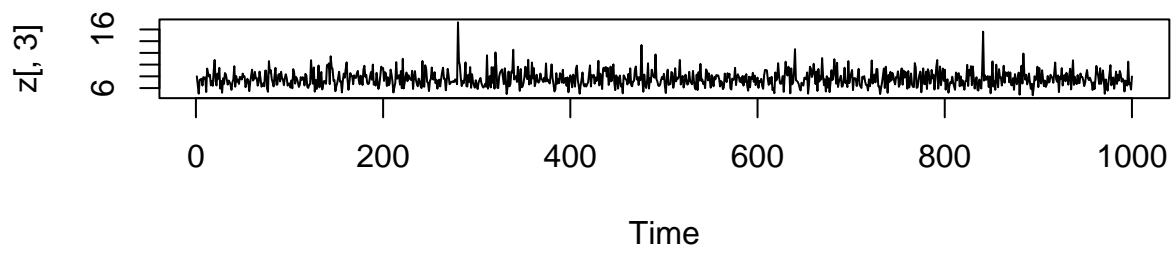
```
par(mfrow=c(2,1))
ts.plot(z[,2])
acf(z[,2],lag=50)
```



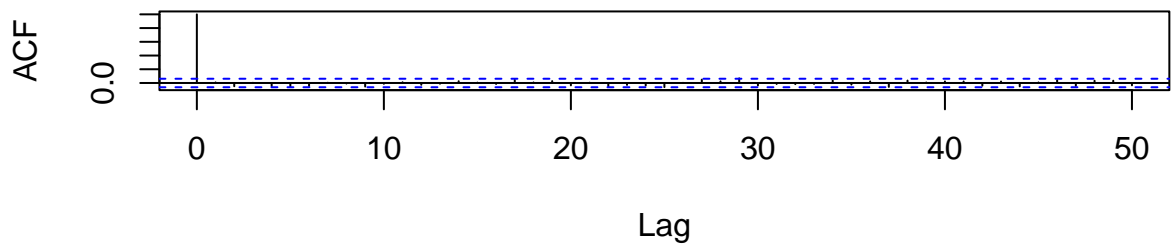
Series $z[, 2]$



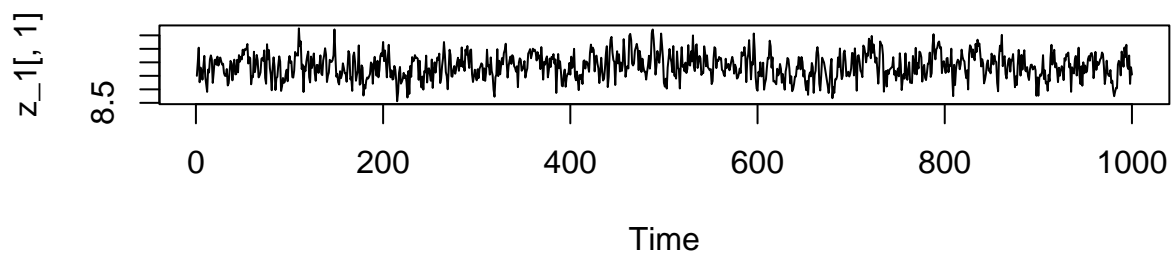
```
par(mfrow=c(2,1))
ts.plot(z[,3])
acf(z[,3],lag=50)
```



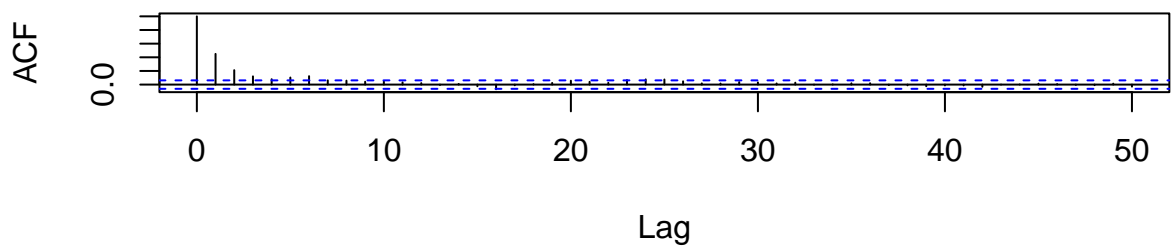
Series $z[, 3]$



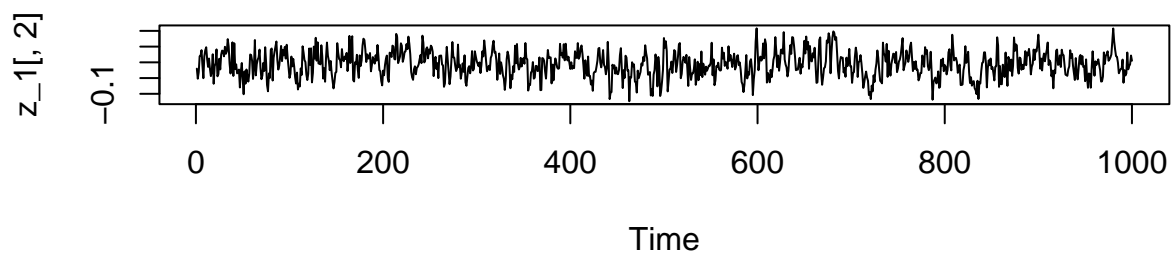
```
## plot the marginal distribution for different initial values  
par(mfrow=c(2,1))  
ts.plot(z_1[,1])  
acf(z_1[,1],lag=50)
```



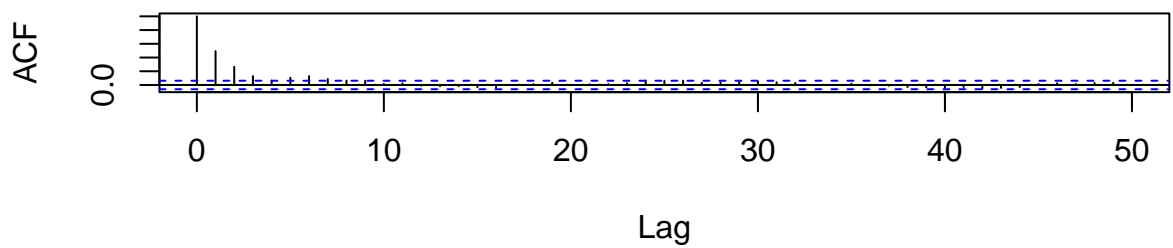
Series $z_1[, 1]$



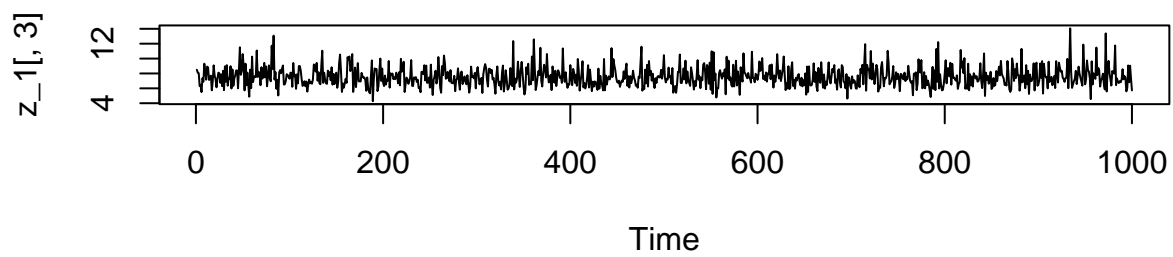
```
par(mfrow=c(2,1))
ts.plot(z_1[,2])
acf(z_1[,2],lag=50)
```



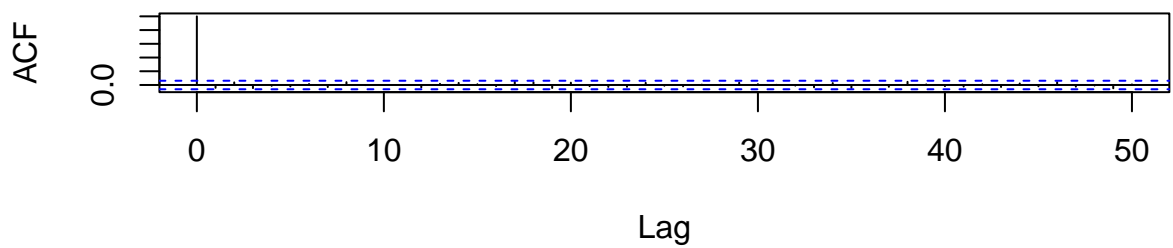
Series $z_1[, 2]$



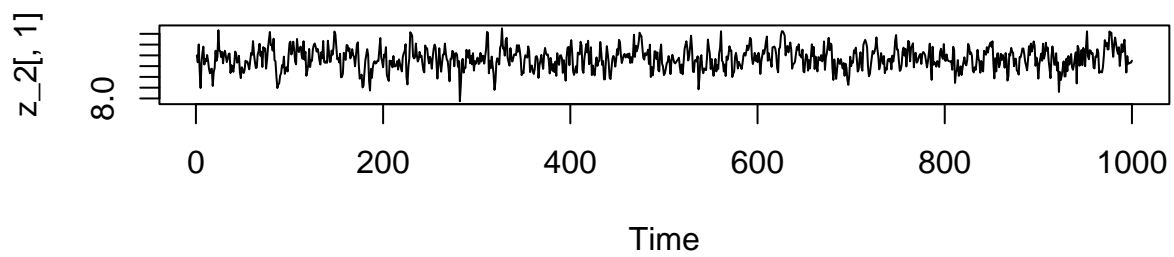
```
par(mfrow=c(2,1))
ts.plot(z_1[,3])
acf(z_1[,3],lag=50)
```



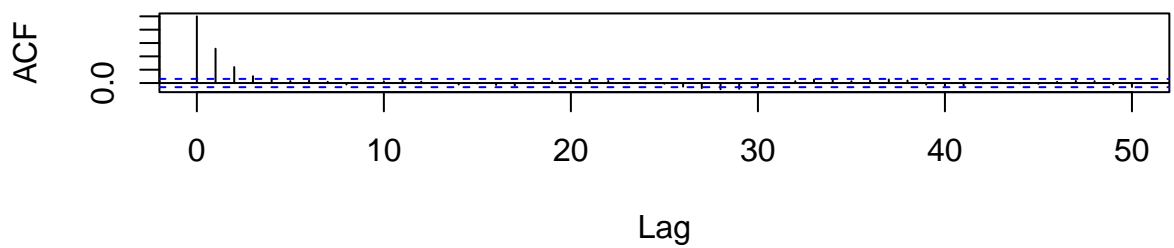
Series $z_1[, 3]$



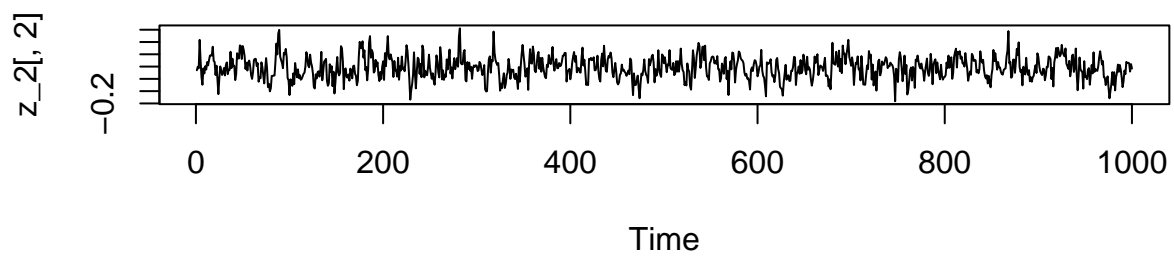
```
par(mfrow=c(2,1))
ts.plot(z_2[,1])
acf(z_2[,1],lag=50)
```

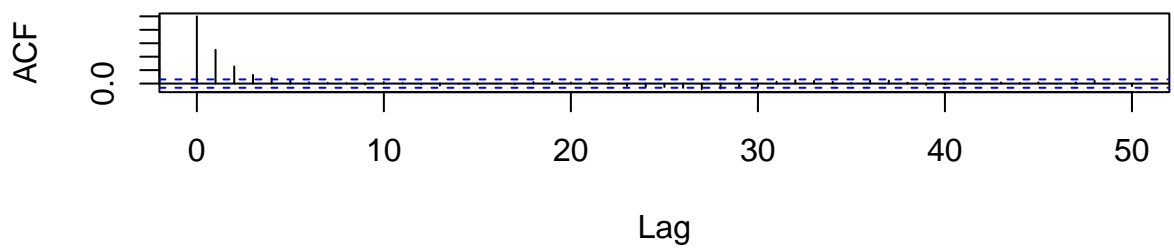
Series `z_2[, 1]`



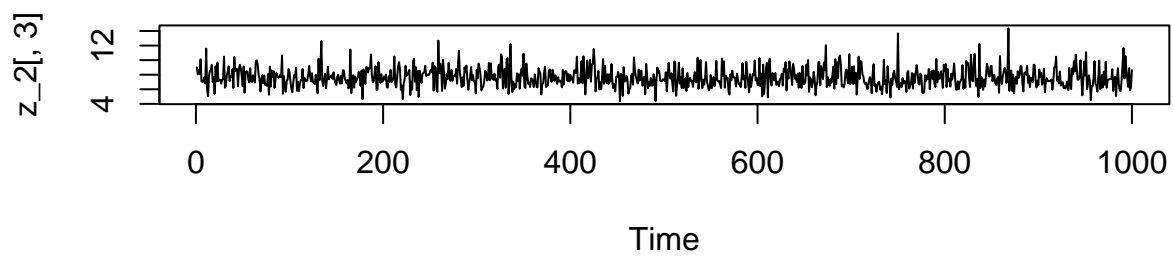
```
par(mfrow=c(2,1))
ts.plot(z_2[,2])
acf(z_2[,2],lag=50)
```



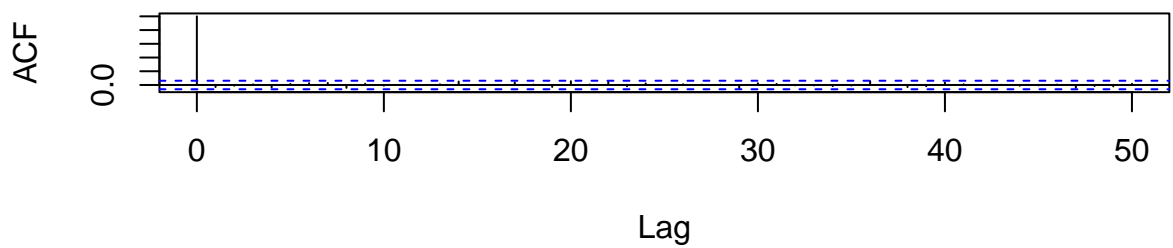
Series z_2[, 2]



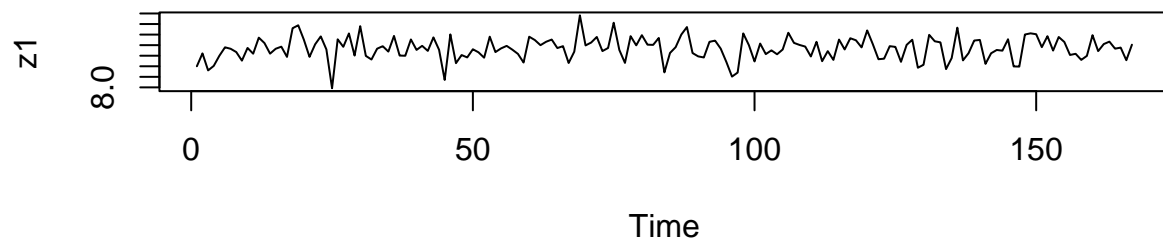
```
par(mfrow=c(2,1))  
ts.plot(z_2[,3])  
acf(z_2[,3],lag=50)
```



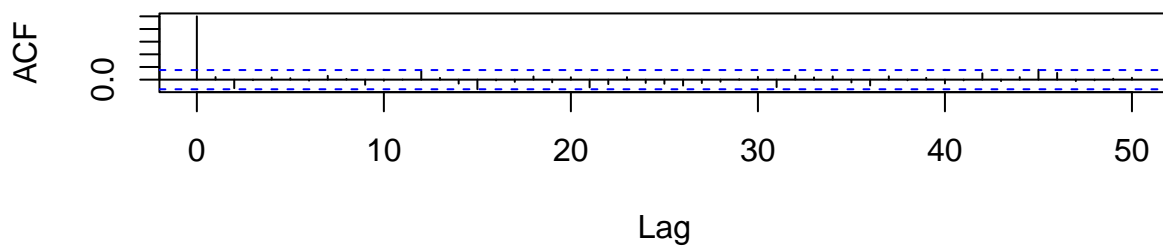
Series `z_2[, 3]`



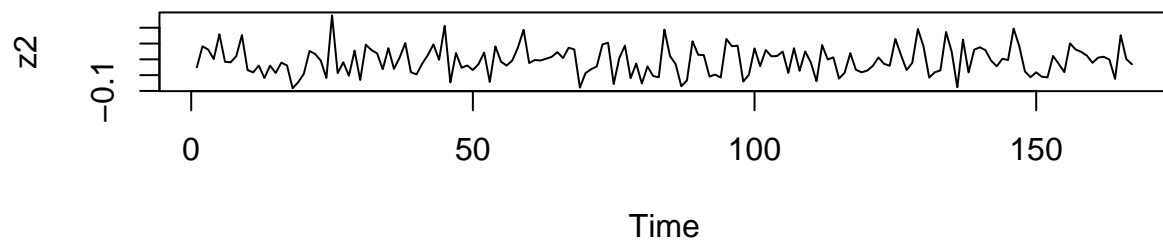
```
## To get independent sample
## This is called thinning
s<-seq(1,1000,6)
z1<-z[,1][1:1000]
z1<-z1[s]
par(mfrow=c(2,1))
ts.plot(z1)
acf(z1,lag=50)
```



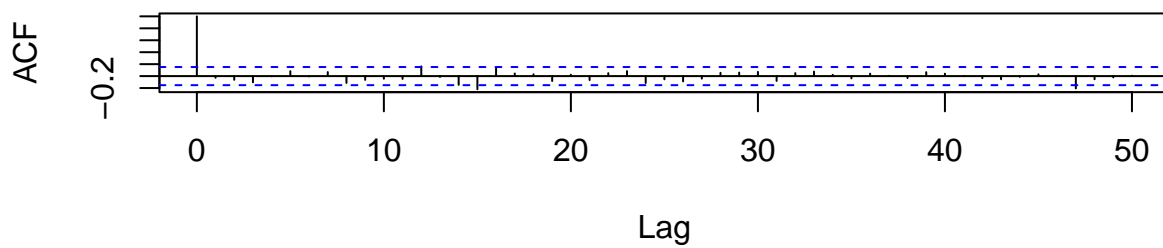
Series z_1



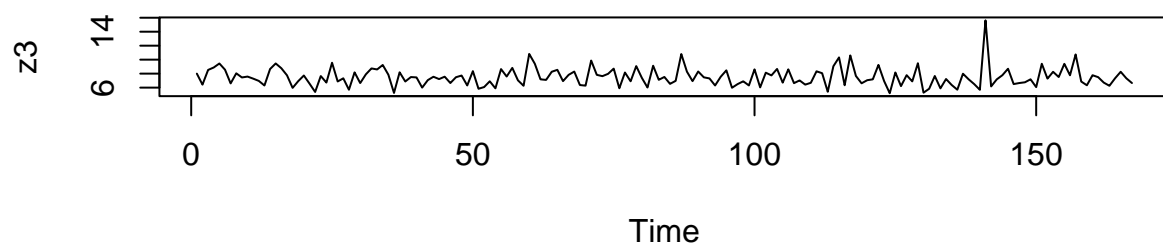
```
s2<-seq(1,1000,6)
z2<-z[,2][1:1000]
z2<-z2[s2]
par(mfrow=c(2,1))
ts.plot(z2)
acf(z2,lag=50)
```



Series z_2



```
z3<-z[,3][1:1000]
z3<-z3[s]
par(mfrow=c(2,1))
ts.plot(z3)
acf(z3,lag=50)
```



Series z_3

