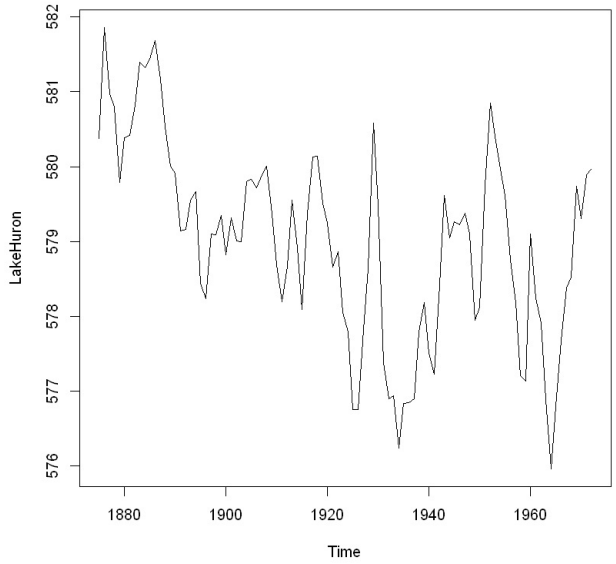
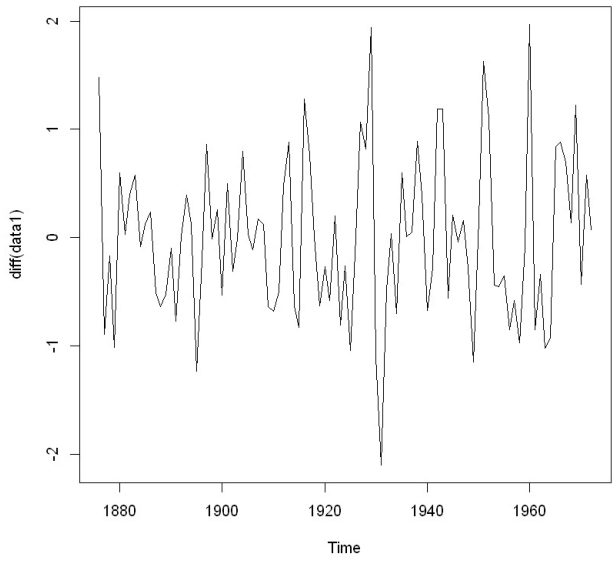
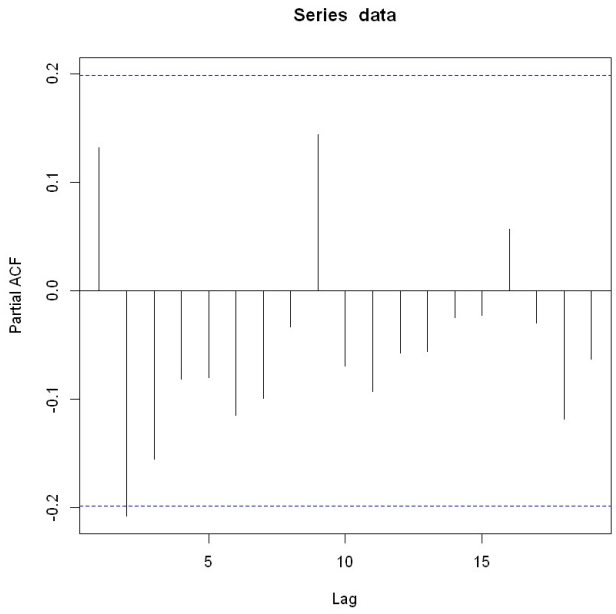
In [3]:
```
plot(LakeHuron)
```



In [5]:
```
data1<- LakeHuron
plot(diff(data1))
data<-diff(data1)
```



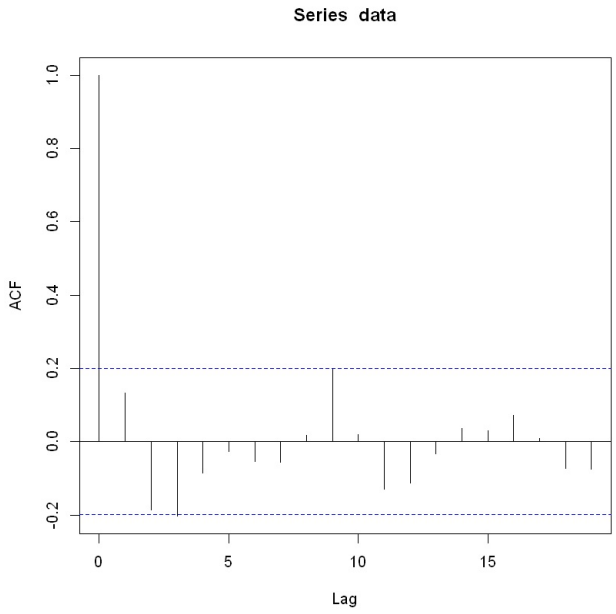
In [6]:
```
pacf(data)
```



In [8]:
```
(acf(data))
```

```
Autocorrelations of series 'data', by lag

     0      1      2      3      4      5      6      7      8      9     10
 1.000  0.132 -0.187 -0.203 -0.087 -0.026 -0.053 -0.055  0.017  0.200  0.019
    11     12     13     14     15     16     17     18     19
-0.130 -0.112 -0.034  0.036  0.030  0.072  0.008 -0.072 -0.075
```



Yule walker matrix form

In [10]:
```
r=NULL
r[1:2]=acf(diff(LakeHuron), plot=F)$acf[2:3]
r
```

0.131924092945853 · -0.187087447396466

In [11]:
```
R=matrix(1,2,2)
R[1,2]=r[1]
R[2,1]=r[1]
R
```

A matrix: 2 × 2 of type dbl

1.0000000	0.1319241
0.1319241	1.0000000

In [12]:
```
b=matrix(r,nrow=2,ncol=1)
b
```

A matrix: 2 ×

1 of type dbl

0.1319241

-0.1870874

Estimating phi

In [13]:
```
phi.hat=solve(R,b)
phi.hat
```

A matrix: 2 ×

1 of type dbl

0.1593793

-0.2081134

Calculating gamma 0

In [16]:
```
c0=acf(data, type='covariance', plot=F)$acf[1]
c0
```

0.555290530343286

Estimating variance

In [17]:
```
var.hat=c0*(1-sum(phi.hat*r))
var.hat
```

0.521994548155539

Let X_t = LakeHuron and y_t = diff(LakeHroun)

$X_t = 1.1594X_{t-1} - 0.3675X_{t-2} + 0.2081X_{t-3} + Z_t$

where $Z_t \sim$ Normal (0,0.52)

$(1 - 0.1594B + 0.2081B^2)(1-B)X_{t-1} = Z_t$

$Y_t = 0.1594Y_{t-1} - 0.2081Y_{t-2} + Z_t$