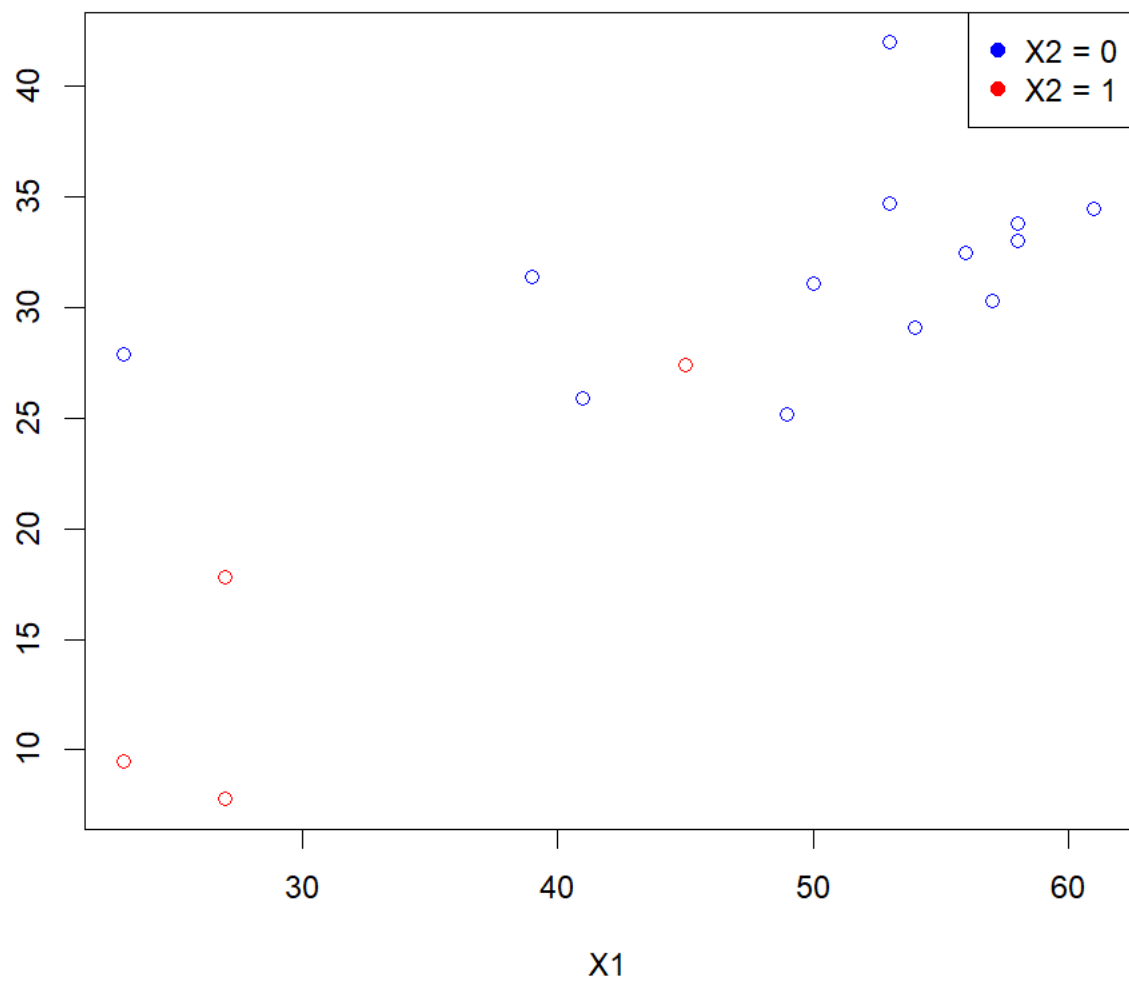


1- a



B

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	15.0708	6.2243	2.421	0.0286	*
X1	0.3392	0.1196	2.835	0.0125	*
X2	-9.7914	3.6966	-2.649	0.0182	*

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

		x1	x2
[1,]	1	23	1
[2,]	1	23	0
[3,]	1	27	1
[4,]	1	27	1
[5,]	1	39	0
[6,]	1	41	0
[7,]	1	45	1
[8,]	1	49	0
[9,]	1	50	0
[10,]	1	53	0
[11,]	1	53	0
[12,]	1	54	0
[13,]	1	56	0
[14,]	1	57	0
[15,]	1	58	0
[16,]	1	58	0

C

```
> (B = solve(t(X_incep)%*%X_incep)%*%(t(X_incep)%*%Y))
      [,1]
      15.0708500
x1      0.3391968
x2     -9.7913515
```

e

```
> (SST = sum((Y-mean(Y))^2))
[1] 1421.538
> (SSE = (t(Y)%*%(I-P)%*%Y))
      [,1]
[1,] 360.8774
```

```
Y = c(9.5,27.9,7.8,17.8,31.4,25.9,27.4,25.2,31.1,34.7,42.0,29.1,32.5,30.3,33.0,33.8,41.1,34.5)
```

```
X1 = c(23,23,27,27,39,41,45,49,50,53,53,54,56,57,58,58,60,61)
```

```
X2 = c(1,0,1,1,0,0,1,0,0,0,0,0,0,0,0,0,0,0)
```

```
colors <- ifelse(X2 == 0, "blue", "red")
```

```
plot(X1, Y, xlab = "X1", ylab = "Y", col = colors)
```

```
legend("topright", legend = c("X2 = 0", "X2 = 1"), col = c("blue", "red"), pch = 16)
```

```
(X_incep = cbind(1,X1,X2))
```

```
fit = lm(Y~X1+X2+1)
```

```
summary(fit)
```

```
B = solve(t(X_incep)%*%X_incep)%*%(t(X_incep)%*%Y)
```

```
P = X_incep%*%(solve(t(X_incep)%*%X_incep))%*%t(X_incep)
```

```
I = matrix(0,nrow =nrow(P),ncol=ncol(P))
```

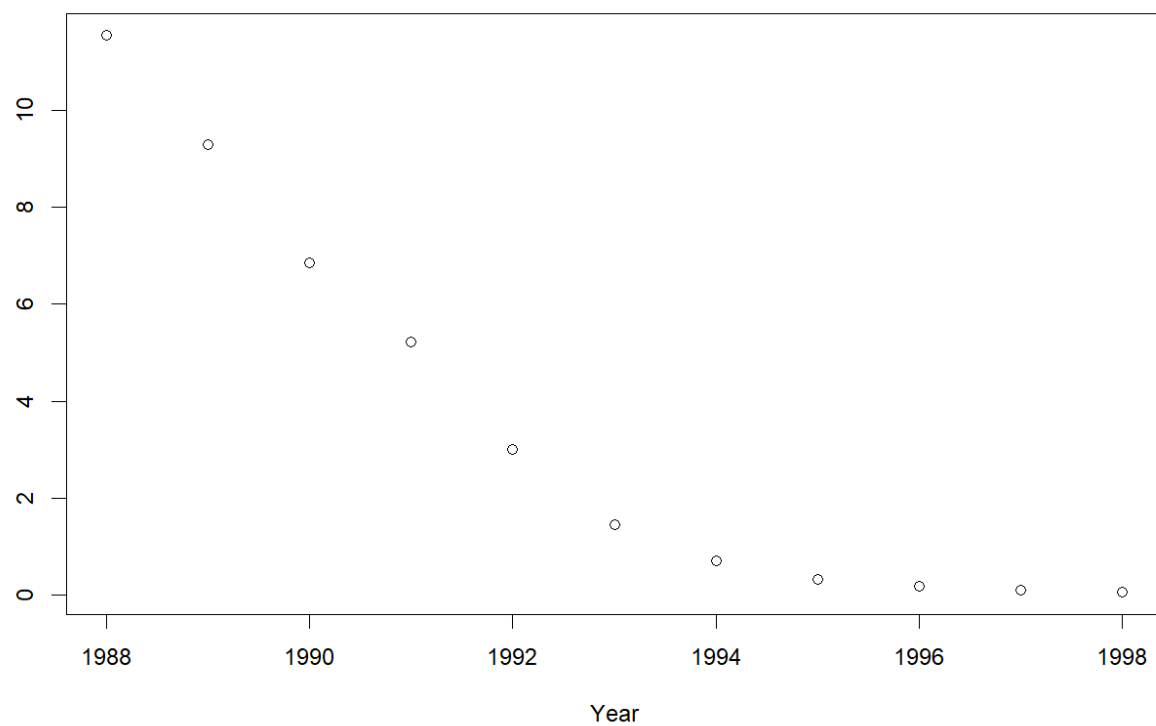
```
diag(I)=1
```

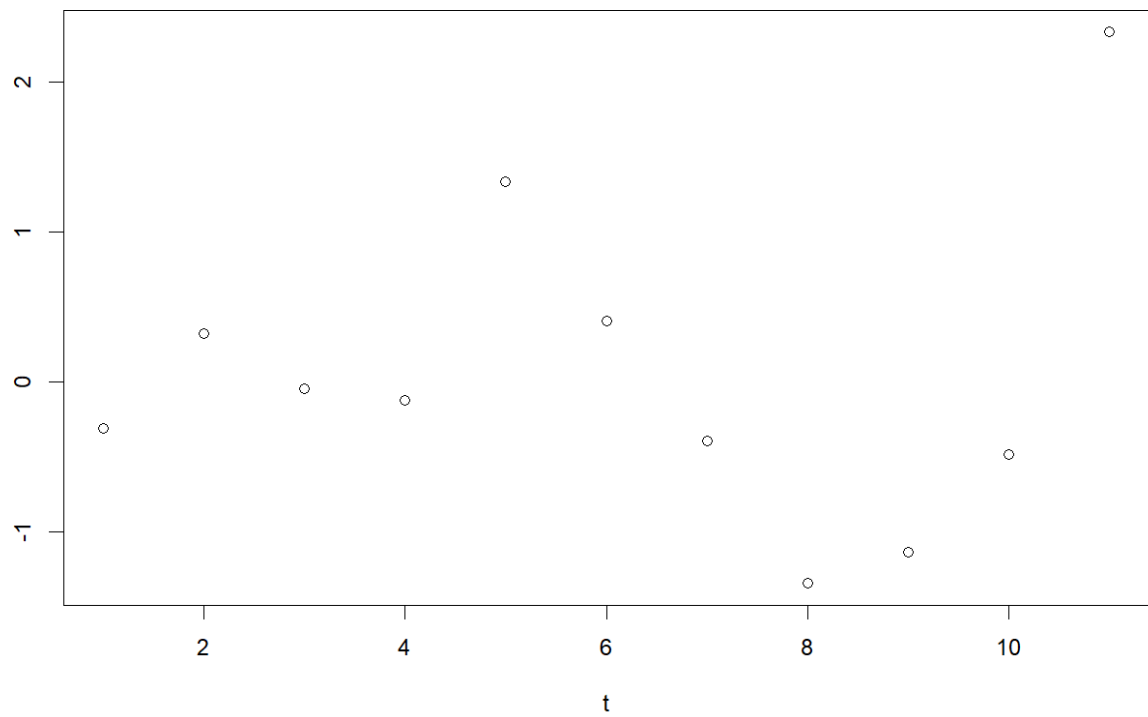
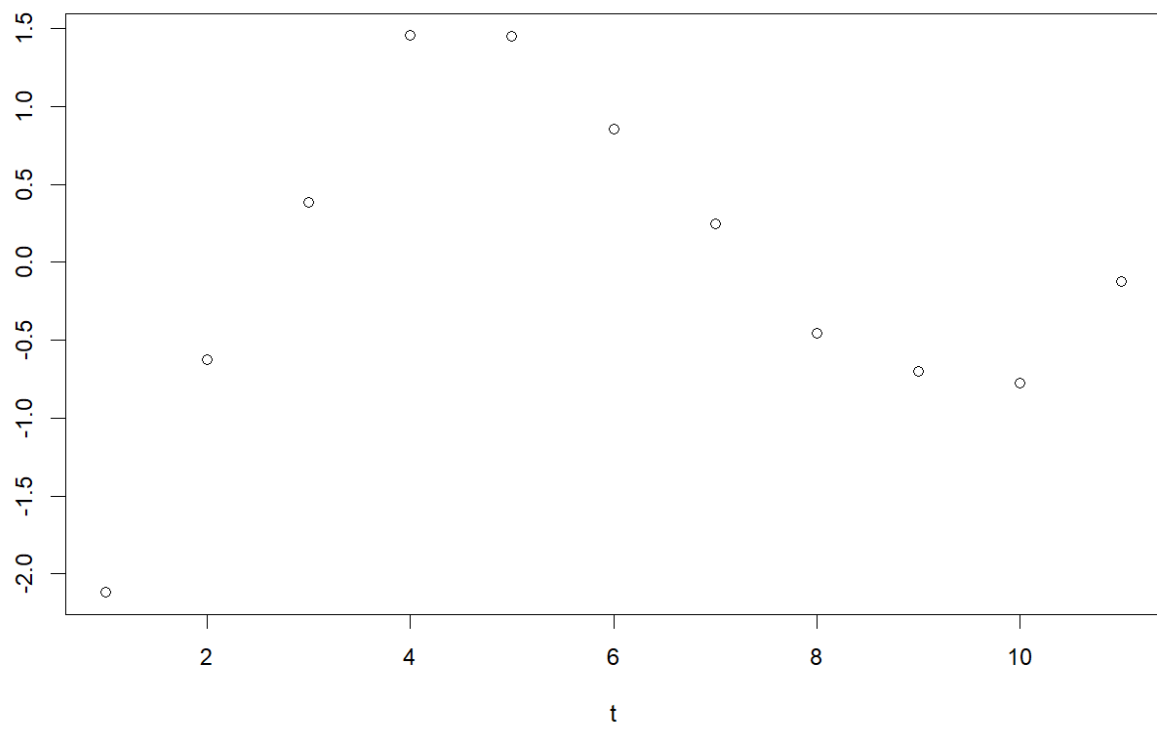
```
(SST = sum((Y-mean(Y))^2))
```

```
(SSE = (t(Y)%*%(I-P)%*%Y))
```

3.

A





```
X = c(seq(1988,1998,1))
```

```
t =X - 1987
```

```
Y = c(11.54,9.30,6.86,5.23,3.0,1.46,0.705,0.333,0.179,0.101,0.068)
```

```
plot(x = X,y = Y,xlab = "Year",ylab = "Price")
```

```
md1 = lm(Y~X)
```

```
md2 = lm((Y~t))
```

```
summary(md1)$coef
```

```
summary(md2)$coef
```

```
Y_log =log(Y)
```

```
md3 = lm(Y_log~t)
```

```
summary(md3)$coef
```

```
ynew=log( Y )
```

```
t=c( 1:11 )
```

```
summary(lm(ynew~t))
```

```
e= rstandard(lm(ynew~t))
```

```
plot( x=t , y=e )
```

```
ynew=log (Y)
```

```
t=c(1:11)
```

```
indicator=c(rep(0,4) ,rep(1,7) )
```

```
summary(lm(ynew~t+indicator ) )
```

```
e2=rstandard(lm(ynew~t+indicator) )
```

```
plot( x=t , y=e2 )
```

```
tindicator = t*
```

```
indicator
```

```
summary(lm(ynew~t+indicator+tindicator) )
```

```
e3=rstandard(lm(ynew~t+indicator+tindicator))
```

```
plot(x=t,y=e3)
```

2.

SSB	362.6
SST	1208.4
SSW	845.8