

Attendance

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2023-12-06

```
library(tidyverse)

## -- Attaching core tidyverse packages ----- tidyverse 2.0.0 --
## v dplyr      1.1.4      v readr      2.1.4
## v forcats    1.0.0      v stringr    1.5.0
## v ggplot2     3.4.3      v tibble     3.2.1
## v lubridate  1.9.2      v tidyr      1.3.0
## v purrr       1.0.2
## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()     masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors

library(GGally)

## Registered S3 method overwritten by 'GGally':
##   method from
##   +.gg      ggplot2
```

Part 1 – Multiple Regression

Crime data set.

These data come from <http://www.statsci.org/data/general/uscrime.html>.

They show various information about 47 states from 1960.

Here are the variable descriptions:

M percentage of males aged 14–24 in total state population

So indicator variable for a southern state

Ed mean years of schooling of the population aged 25 years or over

Po1 per capita expenditure on police protection in 1960

Po2 per capita expenditure on police protection in 1959

LF labour force participation rate of civilian urban males in the age-group 14-24

M.F number of males per 100 females

Pop state population in 1960 in hundred thousands

NW percentage of nonwhites in the population

U1 unemployment rate of urban males 14–24

U2 unemployment rate of urban males 35–39

Wealth median value of transferable assets or family income

Ineq income inequality—percentage of families earning below half the median income

Prob probability of imprisonment—ratio of number of commitments to number of offenses

Time average time in months served by offenders in state prisons before their first release

Crime crime rate—number of offenses per 100,000 population in 1960

The goal is to find what factors predict a high crime rate, that is predict crim.

Read the data

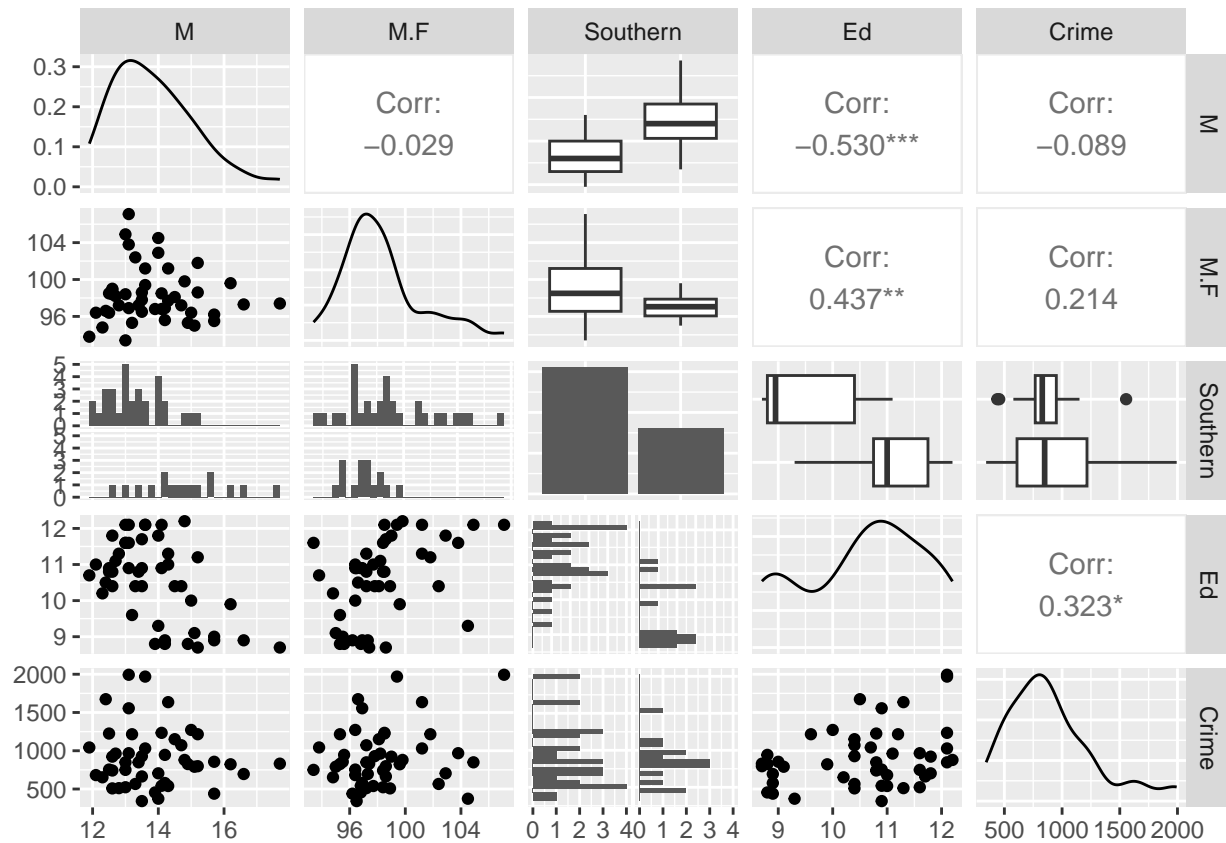
```
UScrime <- read.delim("http://www.statsci.org/data/general/uscrime.txt")
summary(UScrime)
```

```
##           M           So           Ed           Po1
## Min.      :11.90   Min.      :0.0000   Min.      : 8.70   Min.      : 4.50
## 1st Qu.:13.00   1st Qu.:0.0000   1st Qu.: 9.75   1st Qu.: 6.25
## Median :13.60   Median :0.0000   Median :10.80   Median : 7.80
## Mean      :13.86   Mean      :0.3404   Mean      :10.56   Mean      : 8.50
## 3rd Qu.:14.60   3rd Qu.:1.0000   3rd Qu.:11.45   3rd Qu.:10.45
## Max.      :17.70   Max.      :1.0000   Max.      :12.20   Max.      :16.60
##           Po2           LF           M.F           Pop
## Min.      : 4.100   Min.      :0.4800   Min.      : 93.40   Min.      : 3.00
## 1st Qu.: 5.850   1st Qu.:0.5305   1st Qu.: 96.45   1st Qu.:10.00
## Median : 7.300   Median :0.5600   Median : 97.70   Median :25.00
## Mean      : 8.023   Mean      :0.5612   Mean      : 98.30   Mean      :36.62
## 3rd Qu.: 9.700   3rd Qu.:0.5930   3rd Qu.: 99.20   3rd Qu.:41.50
## Max.      :15.700   Max.      :0.6410   Max.      :107.10   Max.      :168.00
##           NW           U1           U2           Wealth
## Min.      : 0.20   Min.      :0.07000   Min.      :2.000   Min.      :2880
## 1st Qu.: 2.40   1st Qu.:0.08050   1st Qu.:2.750   1st Qu.:4595
## Median : 7.60   Median :0.09200   Median :3.400   Median :5370
## Mean      :10.11   Mean      :0.09547   Mean      :3.398   Mean      :5254
## 3rd Qu.:13.25   3rd Qu.:0.10400   3rd Qu.:3.850   3rd Qu.:5915
## Max.      :42.30   Max.      :0.14200   Max.      :5.800   Max.      :6890
##           Ineq           Prob           Time           Crime
## Min.      :12.60   Min.      :0.00690   Min.      :12.20   Min.      : 342.0
## 1st Qu.:16.55   1st Qu.:0.03270   1st Qu.:21.60   1st Qu.: 658.5
## Median :17.60   Median :0.04210   Median :25.80   Median : 831.0
## Mean      :19.40   Mean      :0.04709   Mean      :26.60   Mean      : 905.1
## 3rd Qu.:22.75   3rd Qu.:0.05445   3rd Qu.:30.45   3rd Qu.:1057.5
## Max.      :27.60   Max.      :0.11980   Max.      :44.00   Max.      :1993.0
```

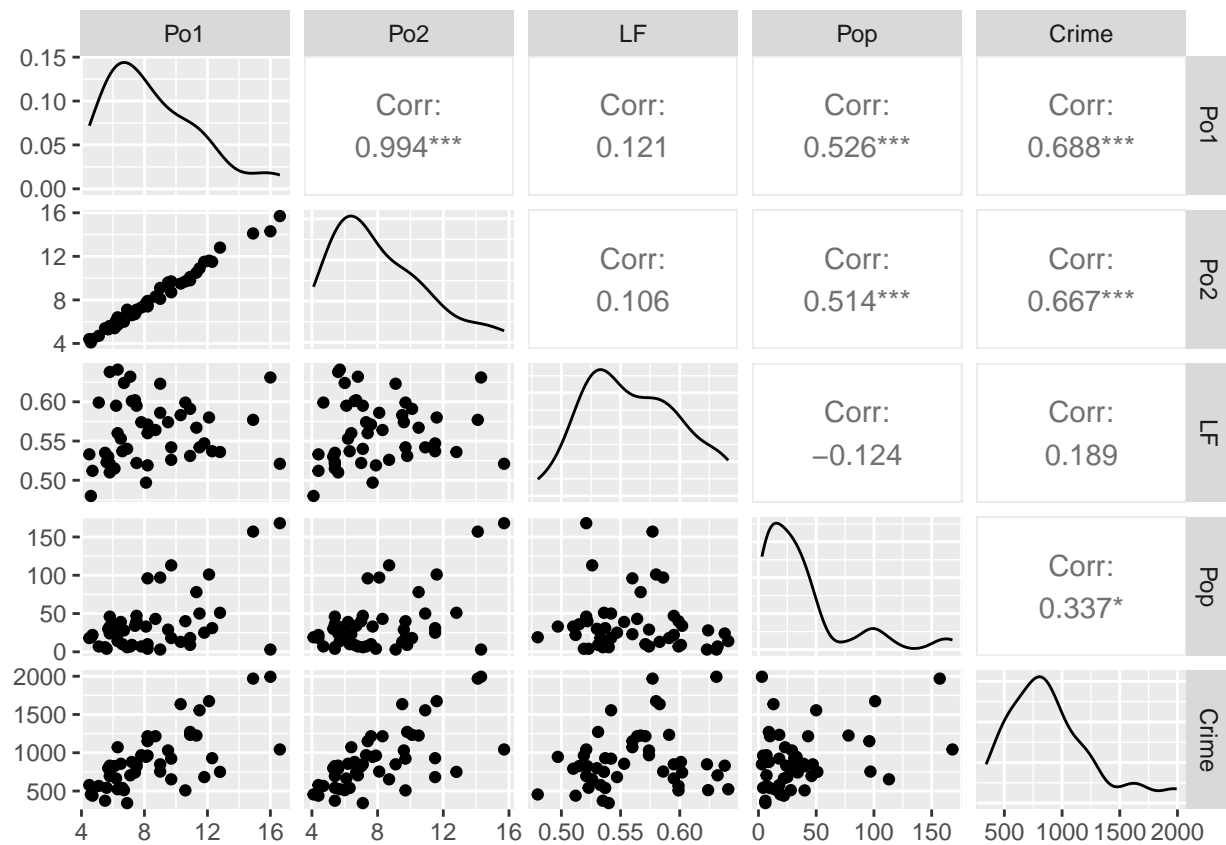
Scatterplot matrixes

We will do this a couple at a time so we can see the scatterplots.

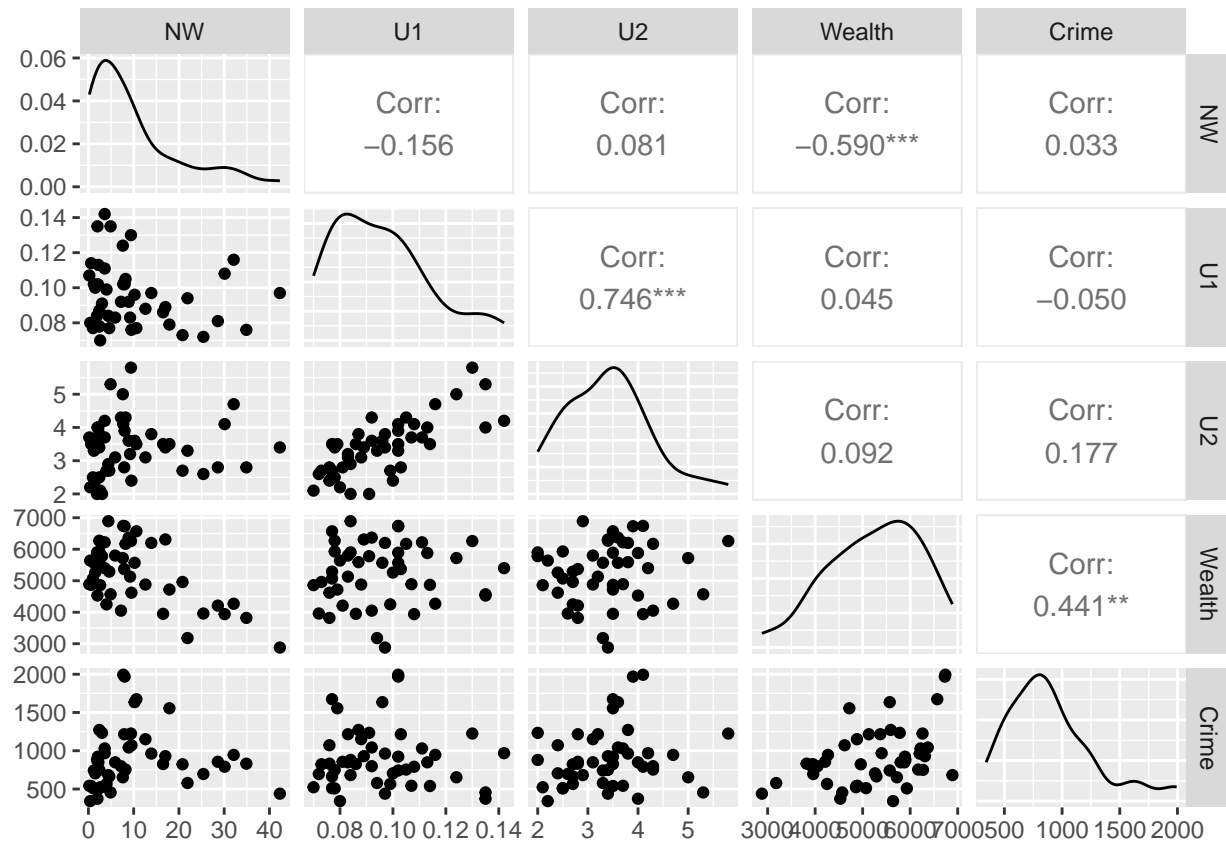
```
mutate(UScrime,Southern=as.logical(So)) |>
ggpairs(columns=c("M","M.F","Southern","Ed","Crime"))
```



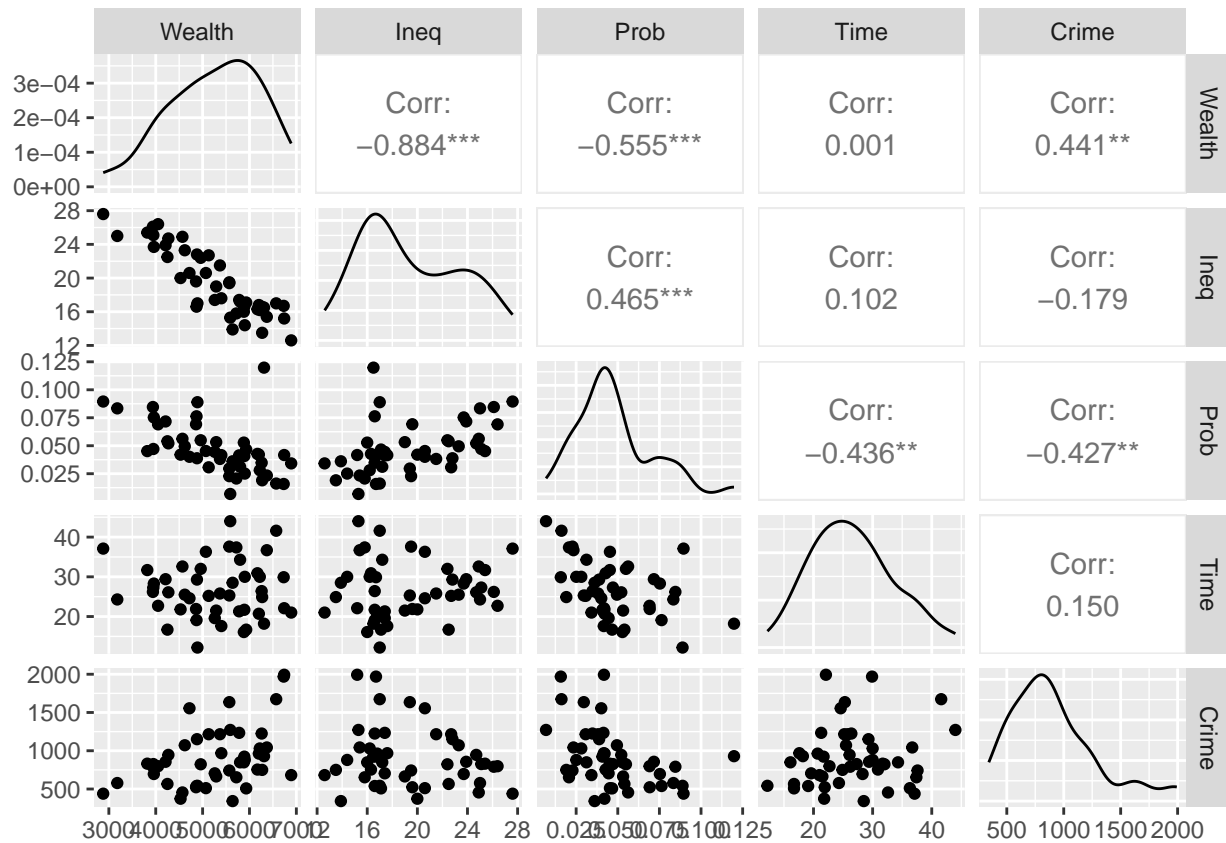
```
mutate(UScrime, Southern=as.logical(So)) |>
ggpairs(columns=c("Po1", "Po2", "LF", "Pop", "Crime"))
```



```
mutate(UScrime, Southern=as.logical(So)) |>
ggpairs(columns=c("NW", "U1", "U2", "Wealth", "Crime"))
```



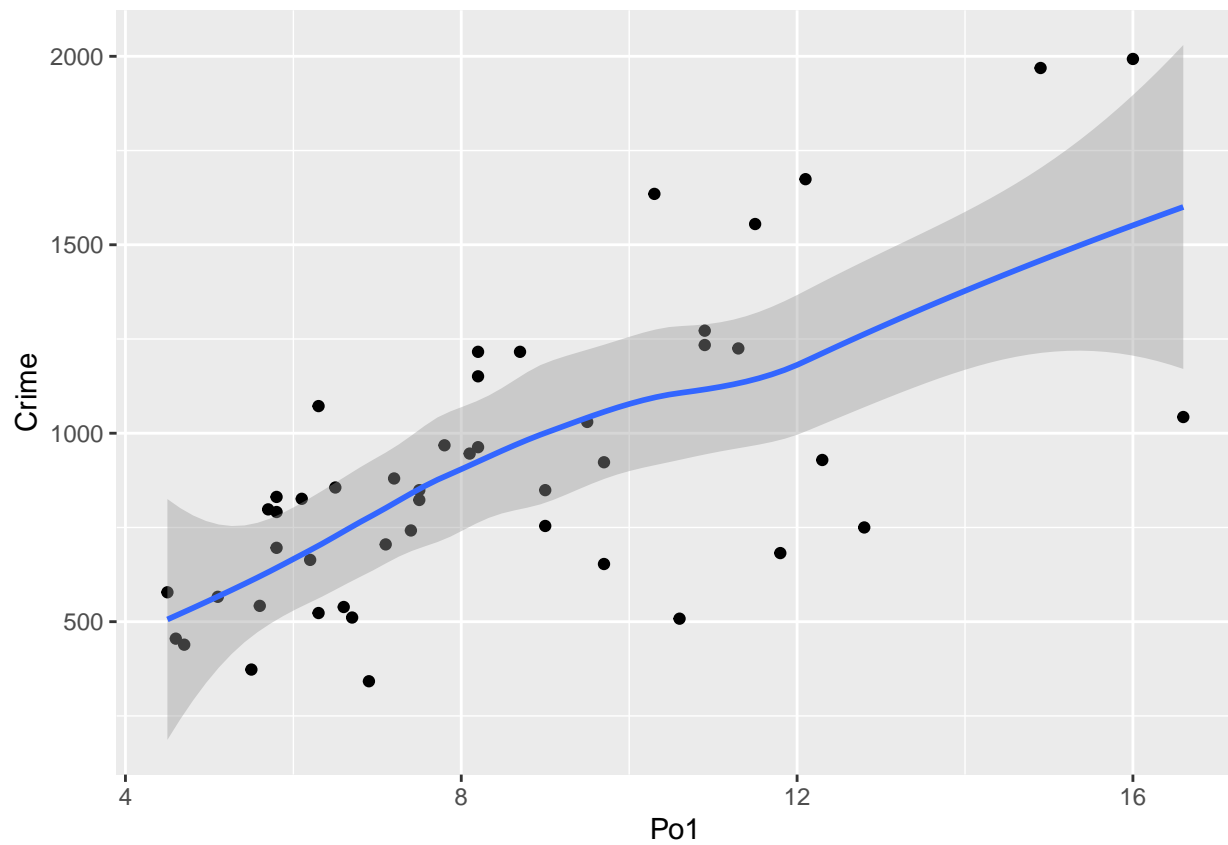
```
mutate(UScrime, Southern=as.logical(So)) |>
ggpairs(columns=c("Wealth", "Ineq", "Prob", "Time", "Crime"))
```



Scatterplot with Policing

```
ggplot(UScrime, aes(x=Po1, y=Crime)) + geom_point() +
  geom_smooth()
```

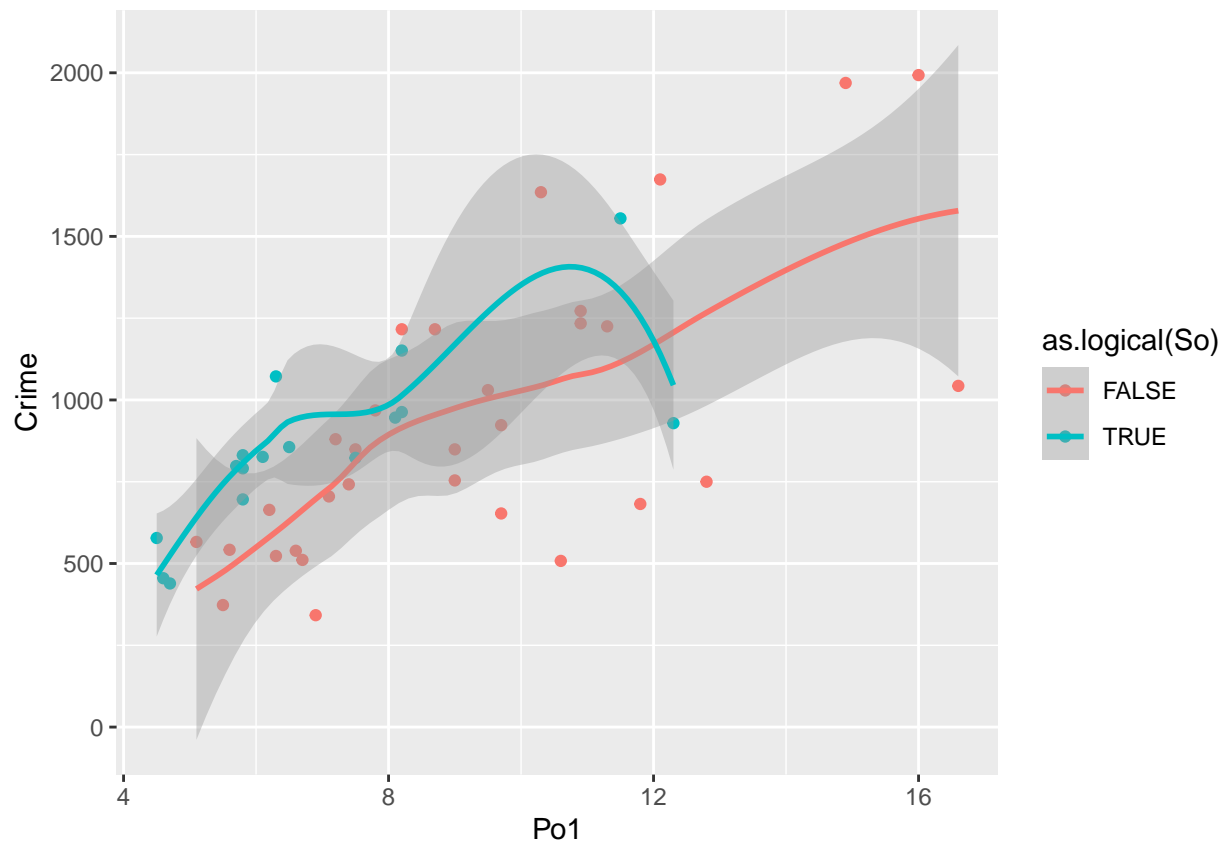
```
## `geom_smooth()` using method = 'loess' and formula = 'y ~ x'
```



```
## Scatterplot with Policing
```

```
ggplot(UScrime, aes(x=Po1, y=Crime, color=as.logical(So))) + geom_point() +  
  geom_smooth()
```

```
## `geom_smooth()` using method = 'loess' and formula = 'y ~ x'
```



Model with just policing

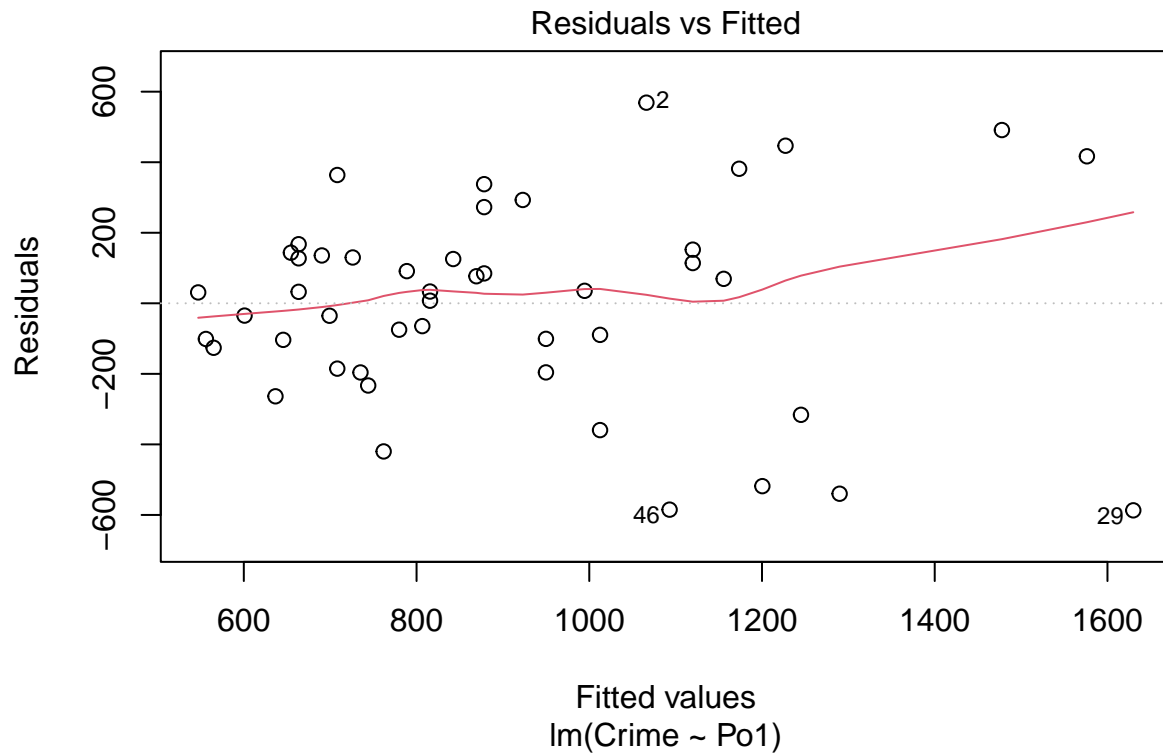
```
lmPo1 <- lm(Crime~Po1,data=UScrime)
summary(lmPo1)
```

```
##
## Call:
## lm(formula = Crime ~ Po1, data = UScrime)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -586.91 -155.63   32.52  139.58  568.84
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   144.46    126.69   1.140   0.26
## Po1           89.48     14.09   6.353 9.34e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 283.9 on 45 degrees of freedom
## Multiple R-squared:  0.4728, Adjusted R-squared:  0.4611
## F-statistic: 40.36 on 1 and 45 DF, p-value: 9.338e-08
```

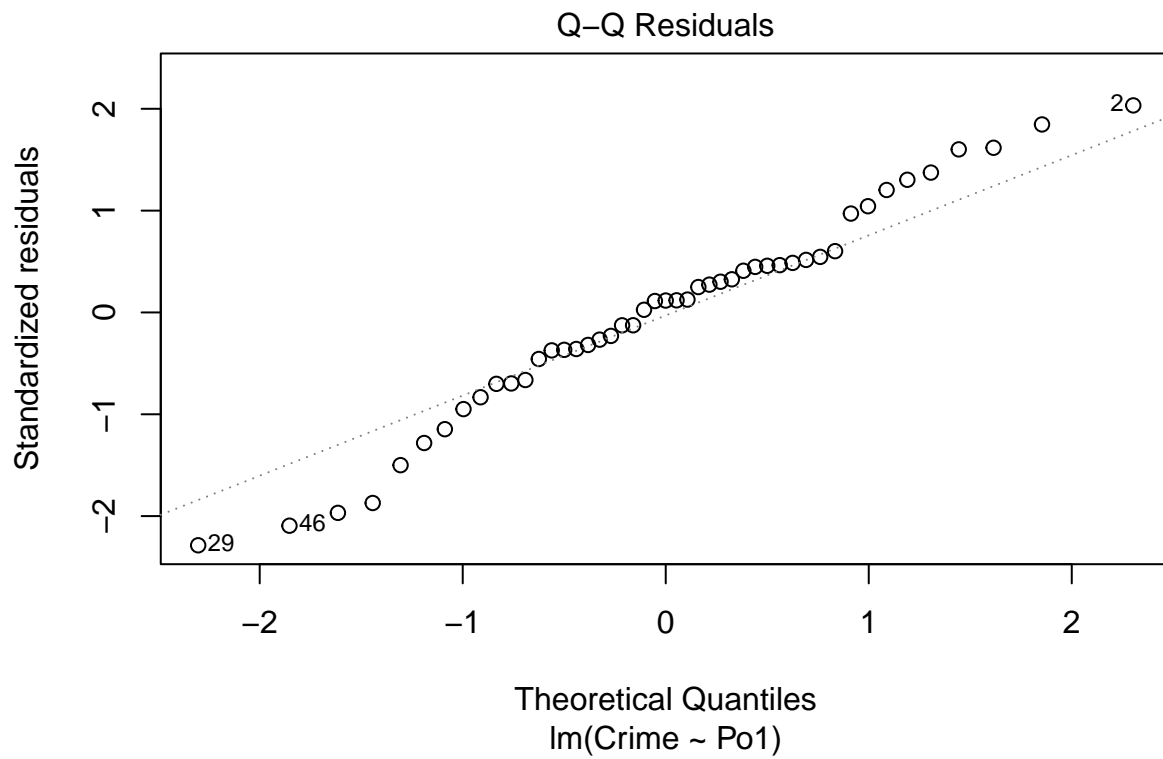
Diagnostic plots

Using the `which` argument allow us to look at the plots one at a time. (The default uses plots 1, 2, 3 and 5).

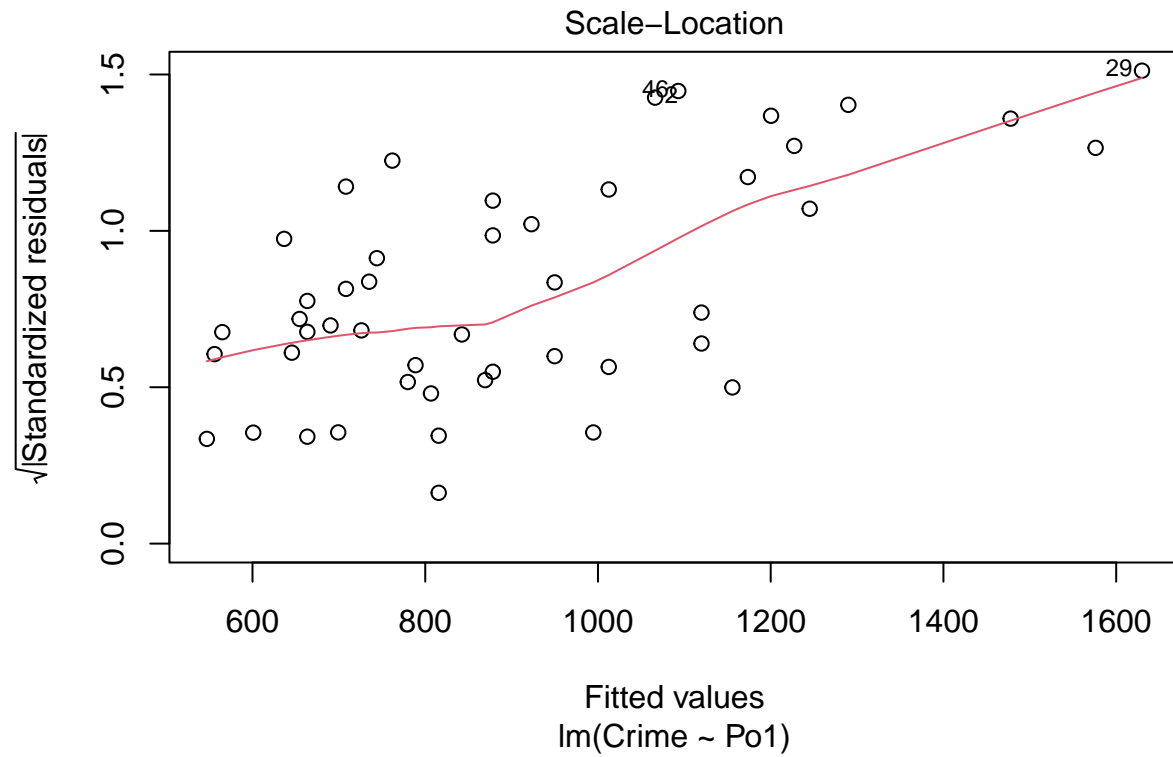

```
plot(lmPo1,which=1)
```



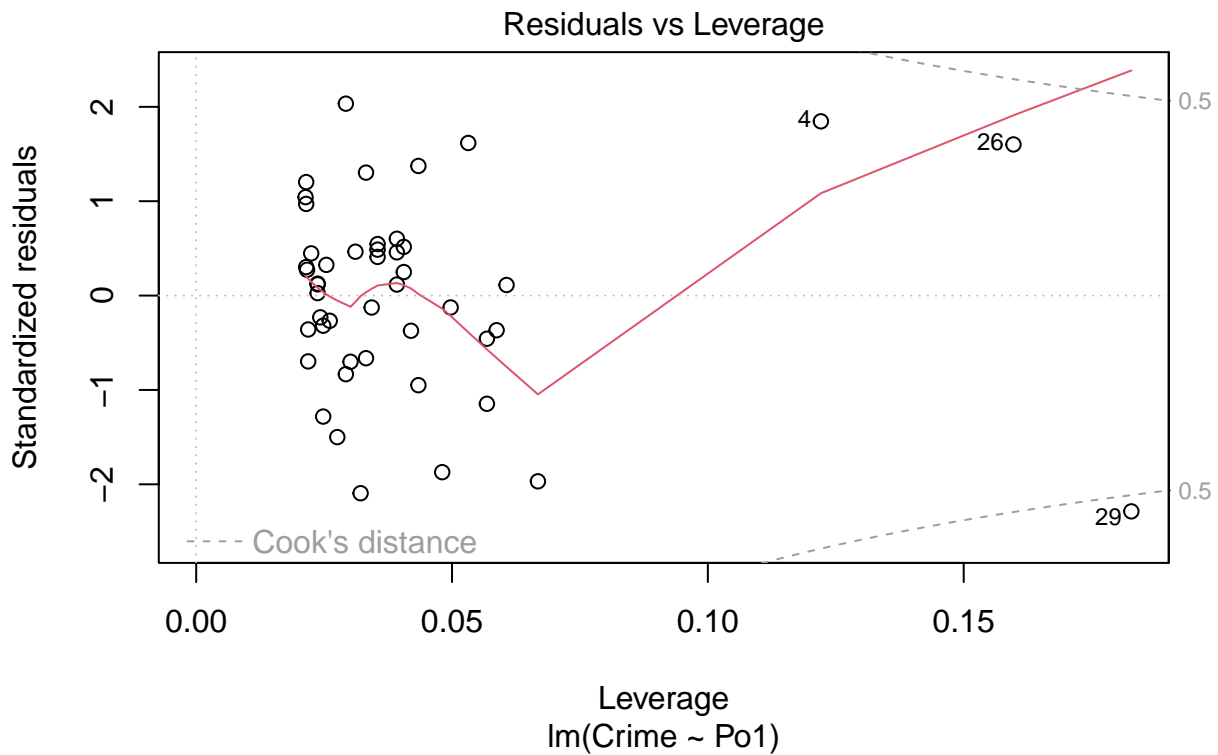
```
plot(lmPo1,which=2)
```



```
plot(lmPo1,which=3)
```



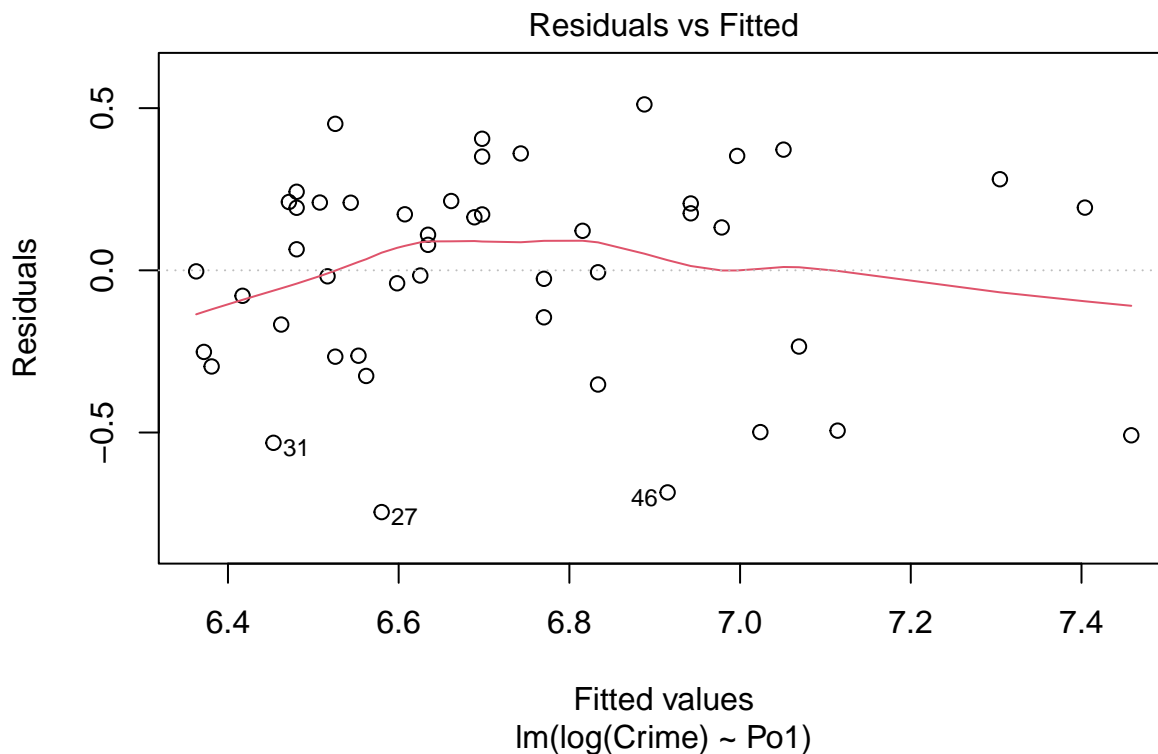
```
plot(lmPo1, which=5)
```



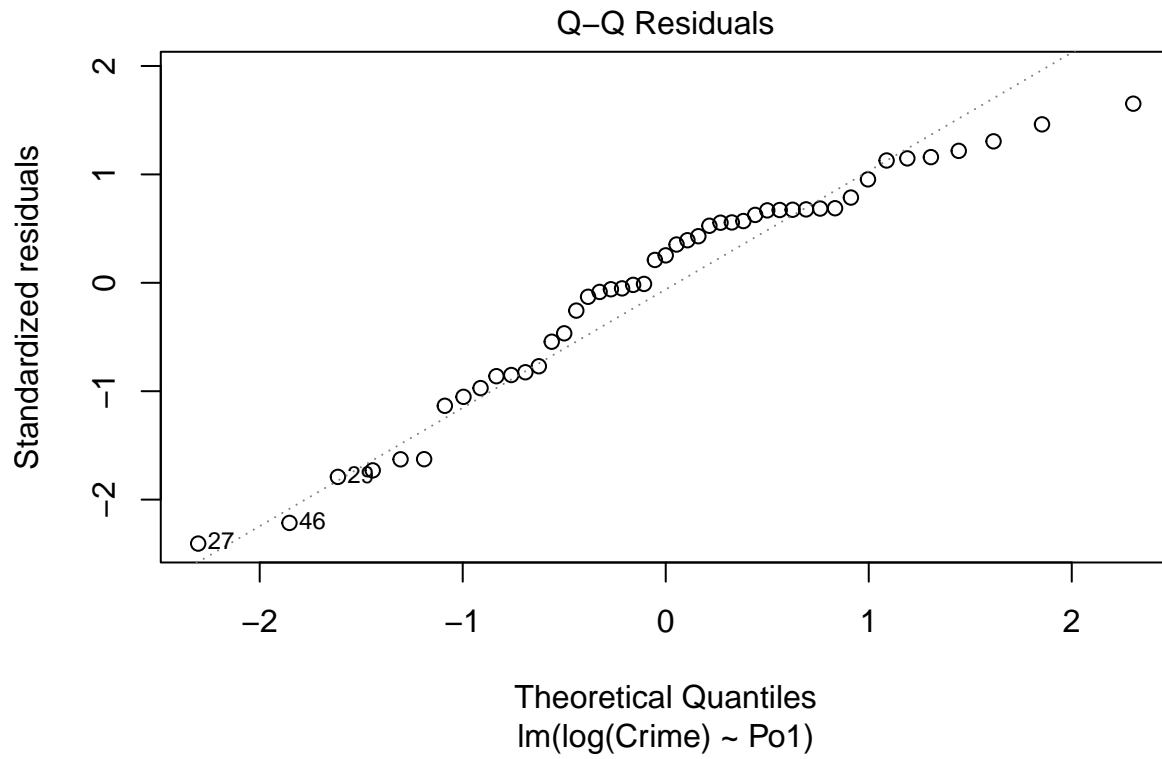
Data using log crime rate as Y

```
lm1Po1 <- lm(log(Crime)~Po1,data=UScrime)
summary(lm1Po1)
```

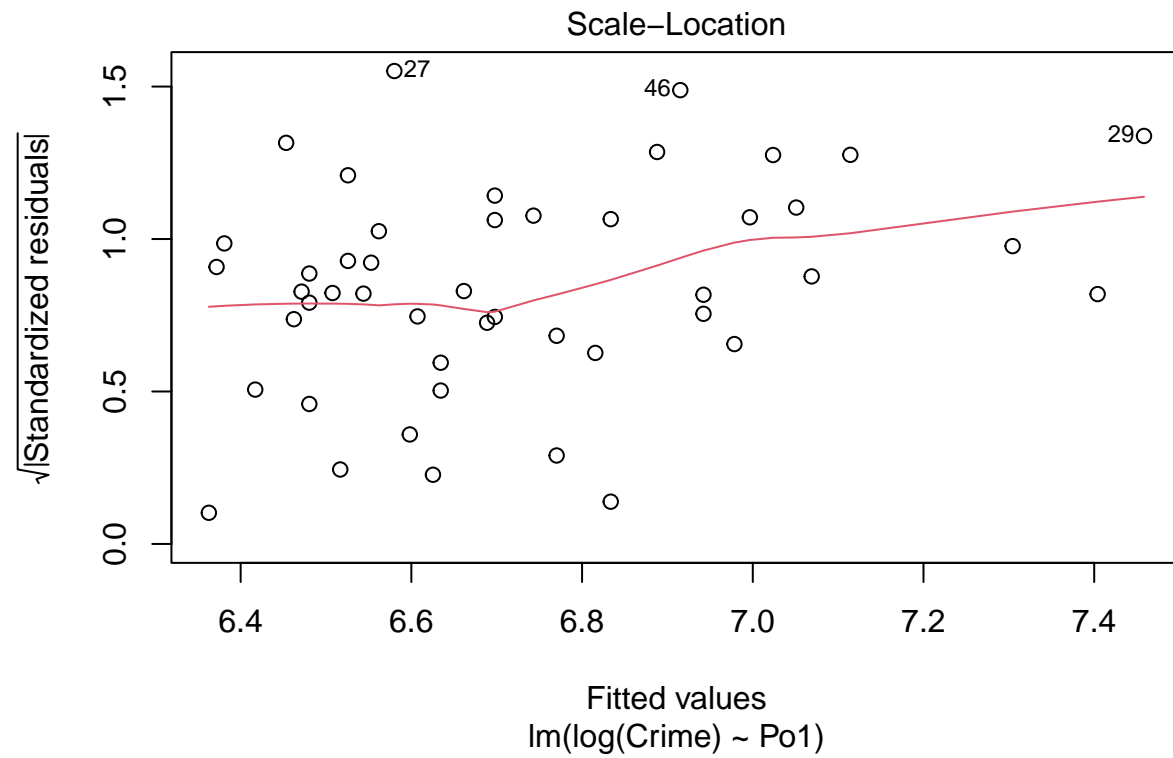
```
##
## Call:
## lm(formula = log(Crime) ~ Po1, data = UScrime)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.74525 -0.24321  0.07857  0.20870  0.51148
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  5.95530    0.14019  42.480 < 2e-16 ***
## Po1          0.09055    0.01559   5.809 5.99e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.3142 on 45 degrees of freedom
## Multiple R-squared:  0.4285, Adjusted R-squared:  0.4158
## F-statistic: 33.75 on 1 and 45 DF,  p-value: 5.991e-07
plot(lm1Po1,which=1)
```



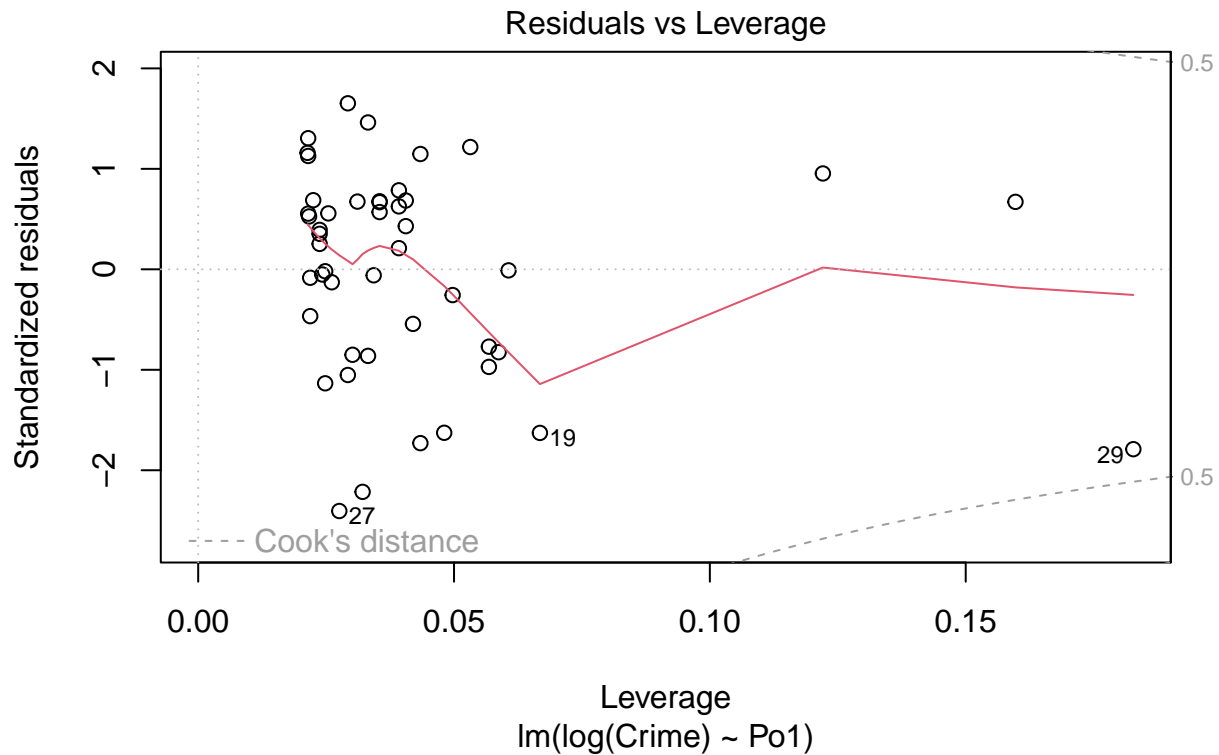
```
plot(lm1Po1,which=2)
```



```
plot(lmlPo1, which=3)
```



```
plot(lmlPo1, which=5)
```



Include Policing in both years

```
lmlPo12 <- lm(log(Crime) ~ Po1 + Po2, data=UScrime)
summary(lmlPo12)
```

```
##
## Call:
## lm(formula = log(Crime) ~ Po1 + Po2, data = UScrime)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.72785 -0.25078  0.07779  0.20564  0.51694
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   5.9670     0.1405  42.455  <2e-16 ***
## Po1           0.2317     0.1377   1.682   0.0997 .
## Po2          -0.1509     0.1464  -1.031   0.3082
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.314 on 44 degrees of freedom
## Multiple R-squared:  0.442, Adjusted R-squared:  0.4167
## F-statistic: 17.43 on 2 and 44 DF, p-value: 2.664e-06
```

Model Search

```
lmlstep <- step(lmlPo1, list(lower=log(Crime)~1,
                             upper=log(Crime)~M+So+Ed+Po1+Po2+LF+M.F+Pop+
```

```
NW+U1+U2+Wealth+Ineq+Prob+Time),
trace=2)
```

```
## Start:  AIC=-106.88
## log(Crime) ~ Po1
##
##      Df Sum of Sq  RSS      AIC
## + Ineq  1    0.8792 3.5625 -115.245
## + M     1    0.7889 3.6528 -114.068
## + So    1    0.4019 4.0398 -109.336
## + NW    1    0.3556 4.0861 -108.800
## <none>          4.4417 -106.878
## + Wealth 1    0.1609 4.2808 -106.612
## + M.F    1    0.1237 4.3181 -106.205
## + Po2    1    0.1048 4.3369 -106.000
## + Prob   1    0.1044 4.3373 -105.996
## + LF     1    0.0685 4.3732 -105.609
## + Time   1    0.0441 4.3976 -105.347
## + U2     1    0.0172 4.4245 -105.060
## + U1     1    0.0167 4.4251 -105.055
## + Ed     1    0.0020 4.4397 -104.899
## + Pop    1    0.0006 4.4412 -104.884
## - Po1    1    3.3309 7.7726 -82.578
##
## Step:  AIC=-115.24
## log(Crime) ~ Po1 + Ineq
##
##      Df Sum of Sq  RSS      AIC
## + Ed     1    0.6651 2.8974 -122.957
## + Wealth 1    0.3731 3.1894 -118.444
## + Prob   1    0.3240 3.2385 -117.727
## + M.F    1    0.2889 3.2737 -117.219
## + LF     1    0.2636 3.2989 -116.858
## + M      1    0.2506 3.3119 -116.673
## <none>          3.5625 -115.245
## + Pop    1    0.1102 3.4523 -114.722
## + NW     1    0.0114 3.5511 -113.396
## + Po2    1    0.0090 3.5535 -113.364
## + U2     1    0.0010 3.5615 -113.259
## + So     1    0.0008 3.5618 -113.255
## + U1     1    0.0004 3.5622 -113.250
## + Time   1    0.0001 3.5625 -113.246
## - Ineq   1    0.8792 4.4417 -106.878
## - Po1    1    4.0312 7.5938 -81.673
##
## Step:  AIC=-122.96
## log(Crime) ~ Po1 + Ineq + Ed
##
##      Df Sum of Sq  RSS      AIC
## + M      1    0.3231 2.5743 -126.514
## + Prob   1    0.2718 2.6257 -125.586
## + Wealth 1    0.1785 2.7190 -123.945
## <none>          2.8974 -122.957
## + U2     1    0.0621 2.8353 -121.976
```

```

## + Time      1      0.0612 2.8362 -121.961
## + So        1      0.0603 2.8371 -121.946
## + NW        1      0.0293 2.8681 -121.435
## + Pop       1      0.0248 2.8727 -121.361
## + M.F       1      0.0248 2.8727 -121.360
## + Po2       1      0.0164 2.8811 -121.224
## + LF        1      0.0029 2.8945 -121.005
## + U1        1      0.0005 2.8970 -120.964
## - Ed        1      0.6651 3.5625 -115.245
## - Ineq      1      1.5423 4.4397 -104.899
## - Po1       1      4.0423 6.9398 -83.905
##
## Step:  AIC=-126.51
## log(Crime) ~ Po1 + Ineq + Ed + M
##
##           Df Sum of Sq   RSS     AIC
## + Wealth  1      0.3214 2.2529 -130.783
## + Prob    1      0.3006 2.2737 -130.350
## + U2      1      0.2284 2.3460 -128.880
## <none>                2.5743 -126.514
## + Time    1      0.0395 2.5348 -125.241
## + U1      1      0.0326 2.5417 -125.114
## + Po2     1      0.0184 2.5559 -124.852
## + So      1      0.0122 2.5621 -124.738
## + M.F     1      0.0055 2.5688 -124.615
## + NW      1      0.0021 2.5722 -124.553
## + Pop     1      0.0009 2.5734 -124.530
## + LF      1      0.0003 2.5740 -124.521
## - M       1      0.3231 2.8974 -122.957
## - Ed      1      0.7376 3.3119 -116.673
## - Ineq    1      0.9792 3.5535 -113.363
## - Po1     1      4.3204 6.8947 -82.211
##
## Step:  AIC=-130.78
## log(Crime) ~ Po1 + Ineq + Ed + M + Wealth
##
##           Df Sum of Sq   RSS     AIC
## + Prob    1      0.18328 2.0696 -132.77
## + U2      1      0.17144 2.0814 -132.50
## <none>                2.2529 -130.78
## + U1      1      0.03043 2.2225 -129.42
## + Po2     1      0.01067 2.2422 -129.01
## + Time    1      0.00944 2.2434 -128.98
## + Pop     1      0.00814 2.2447 -128.95
## + So      1      0.00662 2.2463 -128.92
## + NW      1      0.00226 2.2506 -128.83
## + LF      1      0.00189 2.2510 -128.82
## + M.F     1      0.00051 2.2524 -128.79
## - Wealth  1      0.32144 2.5743 -126.51
## - M       1      0.46609 2.7190 -123.94
## - Ed      1      0.49194 2.7448 -123.50
## - Ineq    1      1.27772 3.5306 -111.67
## - Po1     1      1.56999 3.8229 -107.93
##

```

```

## Step: AIC=-132.77
## log(Crime) ~ Po1 + Ineq + Ed + M + Wealth + Prob
##
##      Df Sum of Sq  RSS    AIC
## + U2      1   0.17432 1.8953 -134.91
## <none>                2.0696 -132.77
## + So      1   0.07749 1.9921 -132.56
## + Pop     1   0.03627 2.0333 -131.60
## + U1      1   0.03183 2.0378 -131.50
## + NW      1   0.03024 2.0394 -131.46
## + Time    1   0.02786 2.0417 -131.41
## + LF      1   0.01169 2.0579 -131.04
## + Po2     1   0.00871 2.0609 -130.97
## + M.F     1   0.00226 2.0673 -130.82
## - Prob    1   0.18328 2.2529 -130.78
## - Wealth  1   0.20413 2.2737 -130.35
## - M       1   0.46138 2.5310 -125.31
## - Ed      1   0.49202 2.5616 -124.75
## - Ineq    1   1.22987 3.2995 -112.85
## - Po1     1   1.50553 3.5751 -109.08
##
## Step: AIC=-134.91
## log(Crime) ~ Po1 + Ineq + Ed + M + Wealth + Prob + U2
##
##      Df Sum of Sq  RSS    AIC
## + U1      1   0.08934 1.8059 -135.18
## <none>                1.8953 -134.91
## + So      1   0.07412 1.8212 -134.78
## + Pop     1   0.03826 1.8570 -133.87
## + NW      1   0.02563 1.8697 -133.55
## + Time    1   0.02198 1.8733 -133.46
## - Wealth  1   0.16015 2.0554 -133.09
## + M.F     1   0.00452 1.8908 -133.02
## + Po2     1   0.00363 1.8917 -133.00
## + LF      1   0.00103 1.8943 -132.93
## - U2      1   0.17432 2.0696 -132.77
## - Prob    1   0.18616 2.0814 -132.50
## - M       1   0.60408 2.4994 -123.90
## - Ed      1   0.65333 2.5486 -122.99
## - Ineq    1   1.14112 3.0364 -114.75
## - Po1     1   1.39138 3.2867 -111.03
##
## Step: AIC=-135.18
## log(Crime) ~ Po1 + Ineq + Ed + M + Wealth + Prob + U2 + U1
##
##      Df Sum of Sq  RSS    AIC
## <none>                1.8059 -135.18
## - U1      1   0.08934 1.8953 -134.91
## + Pop     1   0.05391 1.7520 -134.60
## + Time    1   0.05323 1.7527 -134.58
## + So      1   0.03615 1.7698 -134.13
## - Wealth  1   0.12366 1.9296 -134.06
## + NW      1   0.01361 1.7923 -133.53
## + M.F     1   0.00764 1.7983 -133.38

```



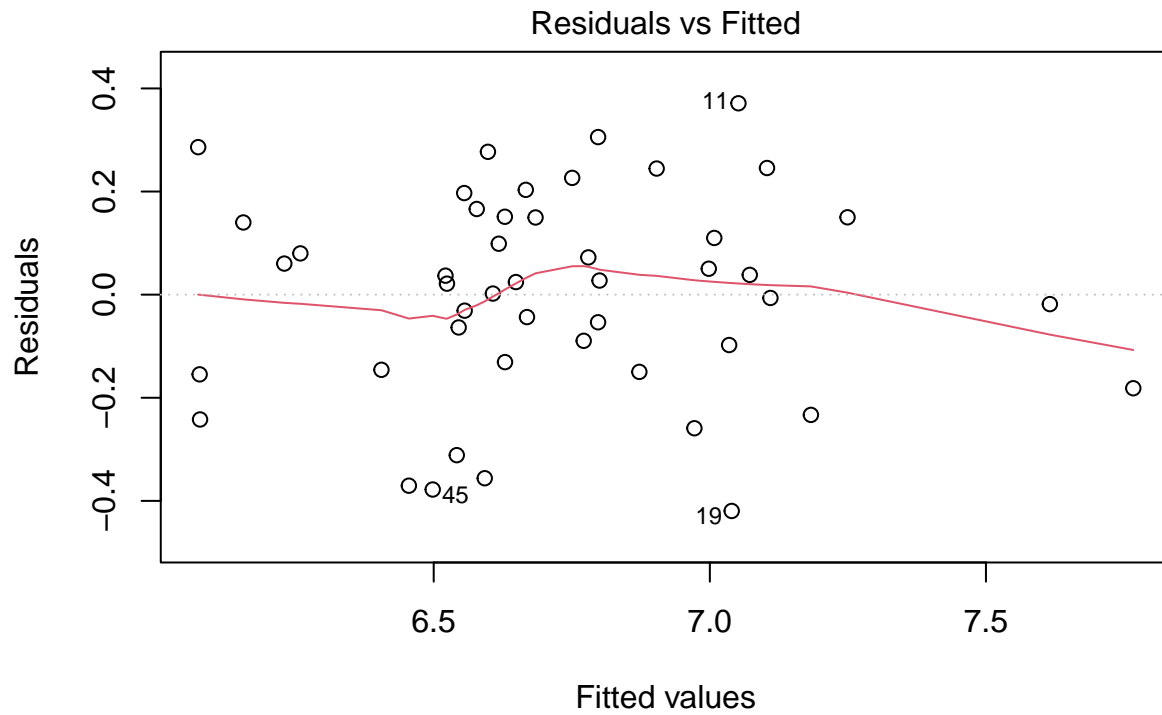
```
## + Po2      1  0.00659 1.7994 -133.35
## + LF       1  0.00055 1.8054 -133.19
## - Prob     1  0.18499 1.9909 -132.59
## - U2       1  0.23183 2.0378 -131.50
## - M        1  0.61287 2.4188 -123.44
## - Ed       1  0.73922 2.5452 -121.05
## - Po1      1  0.99560 2.8015 -116.54
## - Ineq     1  1.01920 2.8251 -116.14
```

Summary of final model

```
summary(lmlstep)
```

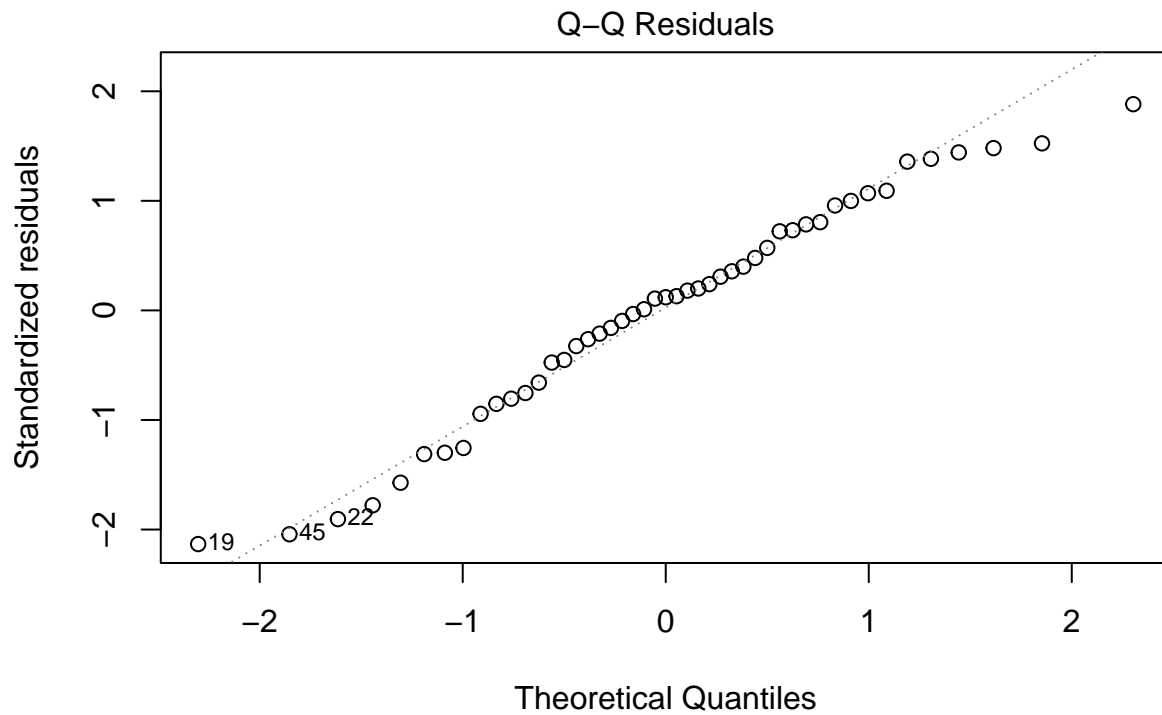
```
##
## Call:
## lm(formula = log(Crime) ~ Po1 + Ineq + Ed + M + Wealth + Prob +
##      U2 + U1, data = UScrime)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.4195 -0.1383  0.0244  0.1499  0.3711
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.7625545   1.1567343   -0.659  0.513723
## Po1          0.0898821   0.0196378    4.577 4.93e-05 ***
## Ineq         0.0891330   0.0192473    4.631 4.17e-05 ***
## Ed           0.2173700   0.0551156    3.944 0.000333 ***
## M            0.1319096   0.0367327    3.591 0.000930 ***
## Wealth       0.0001648   0.0001022    1.613 0.115001
## Prob        -3.3667837   1.7064868   -1.973 0.055810 .
## U2           0.1763804   0.0798590    2.209 0.033304 *
## U1          -4.5719167   3.3345008   -1.371 0.178389
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.218 on 38 degrees of freedom
## Multiple R-squared:  0.7677, Adjusted R-squared:  0.7187
## F-statistic: 15.69 on 8 and 38 DF,  p-value: 6.599e-10
```

```
plot(lmlstep,which=1)
```



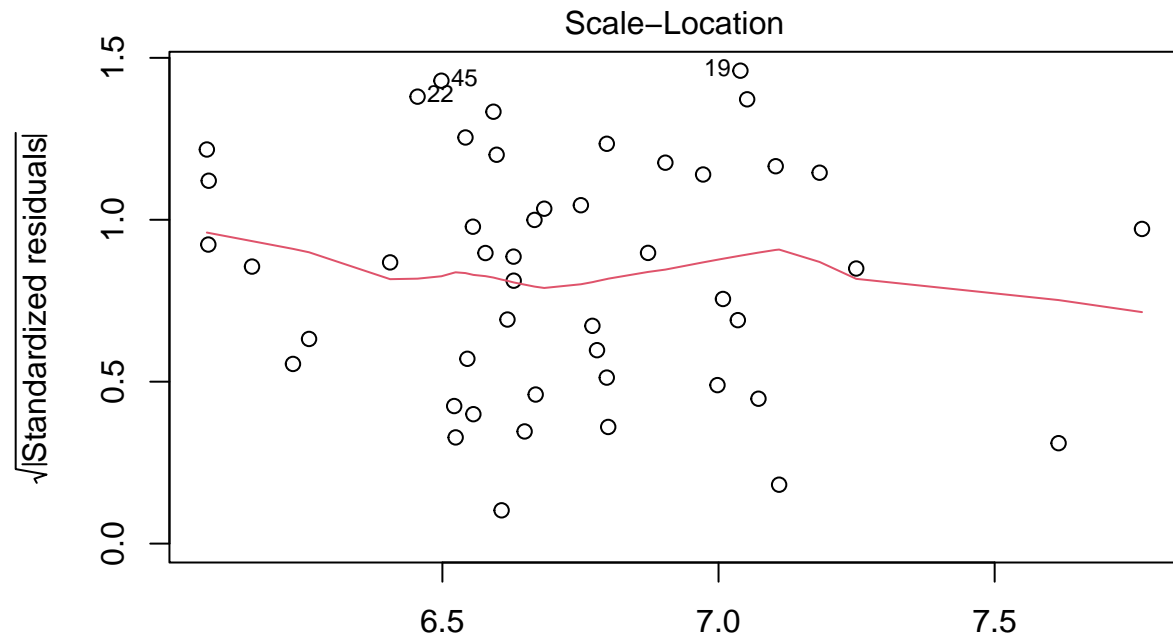
$\text{lm}(\log(\text{Crime}) \sim \text{Po1} + \text{Ineq} + \text{Ed} + \text{M} + \text{Wealth} + \text{Prob} + \text{U2} + \text{U1})$

```
plot(lmlstep, which=2)
```

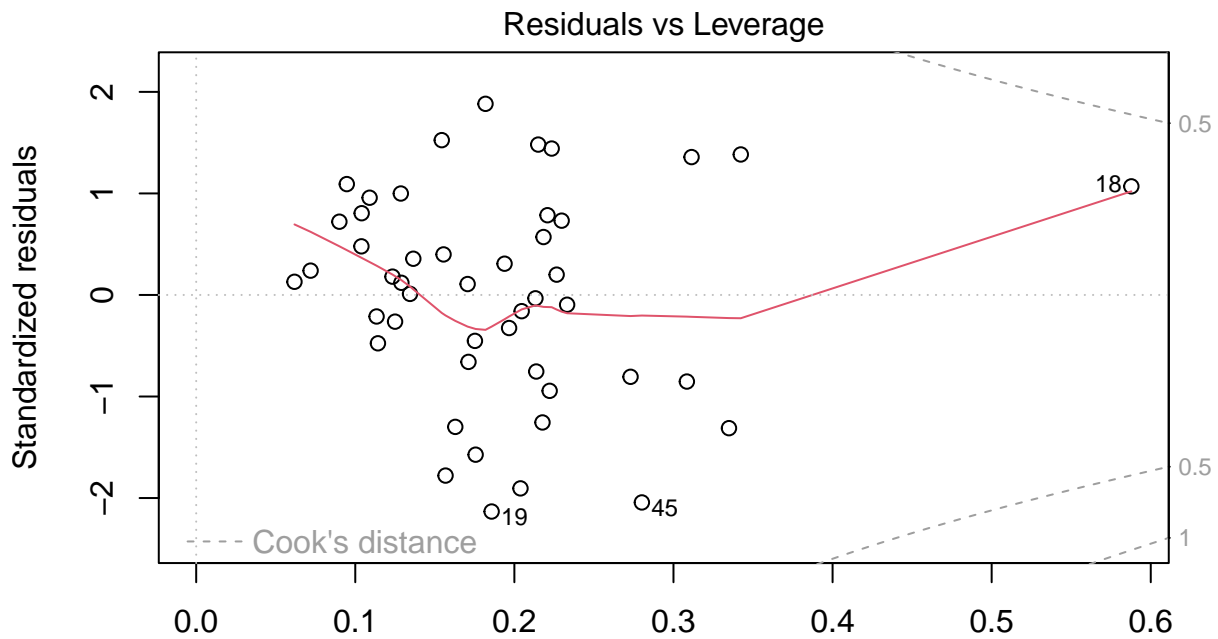


$\text{lm}(\log(\text{Crime}) \sim \text{Po1} + \text{Ineq} + \text{Ed} + \text{M} + \text{Wealth} + \text{Prob} + \text{U2} + \text{U1})$

```
plot(lmlstep, which=3)
```



```
plot(lmlstep, which=5)
```



Analysis with Centered data

Scale all of the variables except Y. Our Y is the last variable

```
UScrimeCC <- scale(UScrime[,ncol(UScrime)])
## Add crime back as unscaled.
UScrimeC <- as.data.frame(cbind(UScrimeCC,Crime=UScrime[,ncol(UScrime)]))
summary(UScrimeC)
```

```
##           M           So           Ed           Po1
## Min.      :-1.5575  Min.      :-0.7107  Min.      :-1.6661  Min.      :-1.3459
## 1st Qu.: -0.6823  1st Qu.: -0.7107  1st Qu.: -0.7275  1st Qu.: -0.7571
## Median : -0.2048  Median : -0.7107  Median :  0.2111  Median : -0.2355
## Mean      : 0.0000  Mean      : 0.0000  Mean      : 0.0000  Mean      : 0.0000
## 3rd Qu.:  0.5908  3rd Qu.:  1.3771  3rd Qu.:  0.7921  3rd Qu.:  0.6561
## Max.      :  3.0575  Max.      :  1.3771  Max.      :  1.4626  Max.      :  2.7255
##           Po2           LF           M.F           Pop
## Min.      :-1.4032  Min.      :-2.00910  Min.      :-1.6636  Min.      :-0.8830
## 1st Qu.: -0.7773  1st Qu.: -0.75947  1st Qu.: -0.6285  1st Qu.: -0.6991
## Median : -0.2587  Median : -0.02948  Median : -0.2043  Median : -0.3051
## Mean      : 0.0000  Mean      : 0.00000  Mean      : 0.0000  Mean      : 0.0000
## 3rd Qu.:  0.5996  3rd Qu.:  0.78711  3rd Qu.:  0.3047  3rd Qu.:  0.1283
## Max.      :  2.7454  Max.      :  1.97488  Max.      :  2.9856  Max.      :  3.4510
##           NW           U1           U2           Wealth
## Min.      :-0.9640  Min.      :-1.4126  Min.      :-1.655178  Min.      :-2.4602
## 1st Qu.: -0.7501  1st Qu.: -0.8302  1st Qu.: -0.767126  1st Qu.: -0.6828
## Median : -0.2444  Median : -0.1924  Median :  0.002519  Median :  0.1204
## Mean      : 0.0000  Mean      : 0.0000  Mean      : 0.000000  Mean      : 0.0000
## 3rd Qu.:  0.3051  3rd Qu.:  0.4732  3rd Qu.:  0.535351  3rd Qu.:  0.6852
## Max.      :  3.1302  Max.      :  2.5810  Max.      :  2.844286  Max.      :  1.6957
##           Ineq           Prob           Time           Crime
## Min.      :-1.7044  Min.      :-1.7677  Min.      :-2.0317  Min.      : 342.0
## 1st Qu.: -0.7144  1st Qu.: -0.6329  1st Qu.: -0.7052  1st Qu.: 658.5
## Median : -0.4512  Median : -0.2195  Median : -0.1125  Median : 831.0
## Mean      : 0.0000  Mean      : 0.0000  Mean      : 0.0000  Mean      : 905.1
## 3rd Qu.:  0.8397  3rd Qu.:  0.3236  3rd Qu.:  0.5437  3rd Qu.:1057.5
## Max.      :  2.0553  Max.      :  3.1980  Max.      :  2.4556  Max.      :1993.0
```

```
lmlstepC <- lm(formula(lmlstep),data=UScrimeC)
summary(lmlstepC)
```

```
##
## Call:
## lm(formula = formula(lmlstep), data = UScrimeC)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.4195 -0.1383  0.0244  0.1499  0.3711
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   6.72494    0.03180  211.484 < 2e-16 ***
## Po1           0.26712    0.05836   4.577 4.93e-05 ***
## Ineq          0.35561    0.07679   4.631 4.17e-05 ***
## Ed            0.24317    0.06166   3.944 0.000333 ***
## M             0.16578    0.04616   3.591 0.000930 ***
## Wealth        0.15902    0.09858   1.613 0.115001
## Prob         -0.07655    0.03880  -1.973 0.055810 .
```

```
## U2          0.14896    0.06744    2.209 0.033304 *
## U1          -0.08243    0.06012   -1.371 0.178389
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.218 on 38 degrees of freedom
## Multiple R-squared:  0.7677, Adjusted R-squared:  0.7187
## F-statistic: 15.69 on 8 and 38 DF,  p-value: 6.599e-10
```

Write out data for SPSS analysis

Want to add the centered data as it is faster to do that here than in SPSS. Change the names on UScrimeC to a common pattern, adding “C” to the end of each.

```
colnames(UScrimeCC) <- paste(colnames(UScrimeCC), "C", sep="")
haven::write_sav(cbind(UScrime, UScrimeCC), "UScrime.sav")
```