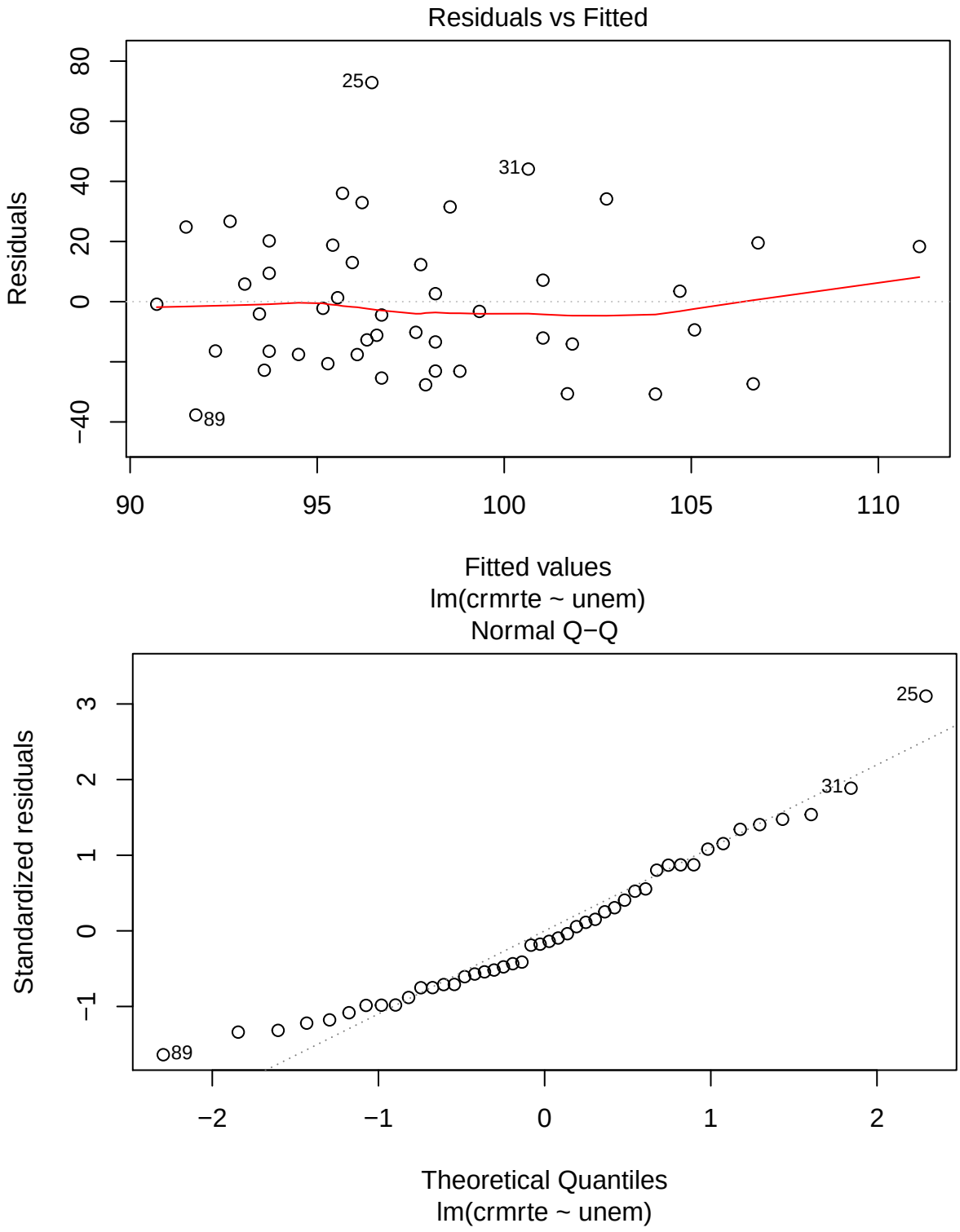
w11_async

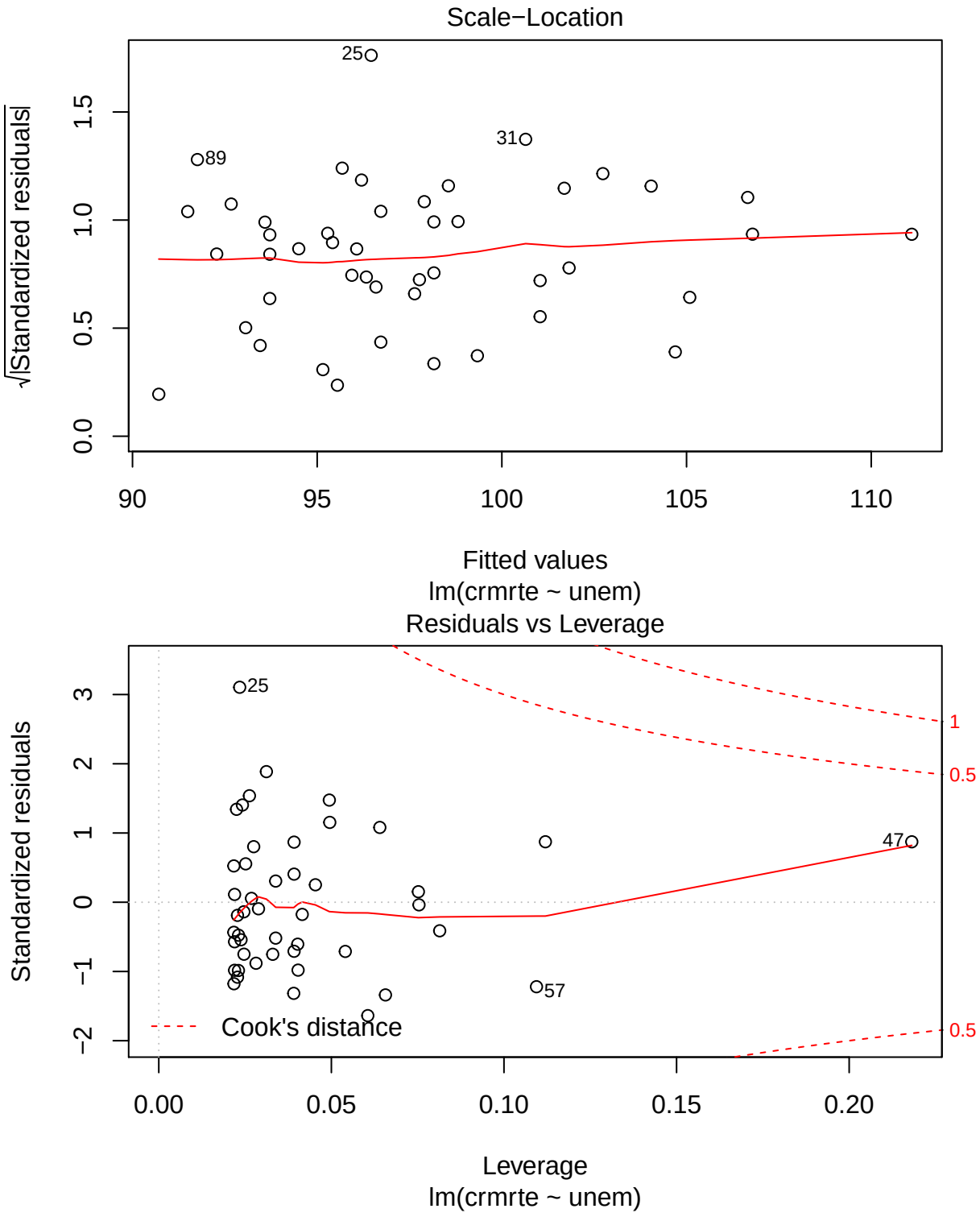
The residual-fitted plot shows a slight increase in variance in the residuals, but the Q-Q plot confirms normality of the response with a few exceptions. This is confirmed by the residuals-leverage plot which shows a few high leverage points.

```
# summary(crime2)

crimes.82 = crime2[crime2$year==82,]
ols.fit1 = lm(crmrte ~ unem, data = crimes.82)
summary(ols.fit1)
```

```
##
## Call:
## lm(formula = crmrte ~ unem, data = crimes.82)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -37.693 -17.292  -3.671  16.994  72.854
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   84.569     10.904   7.756 9.07e-10 ***
## unem           1.307      1.027   1.272     0.21
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 23.74 on 44 degrees of freedom
## Multiple R-squared:  0.03549,    Adjusted R-squared:  0.01357
## F-statistic: 1.619 on 1 and 44 DF,  p-value: 0.2099
```

```
plot(ols.fit1)
```


Residuals vs Fitted
Residuals
Fitted values
lm(crmrte ~ unem)
25
31
89
90
95
100
105
110
−40
0
20
40
60
80
Normal Q−Q
Standardized residuals
Theoretical Quantiles
lm(crmrte ~ unem)
−2
−1
0
1
2
3



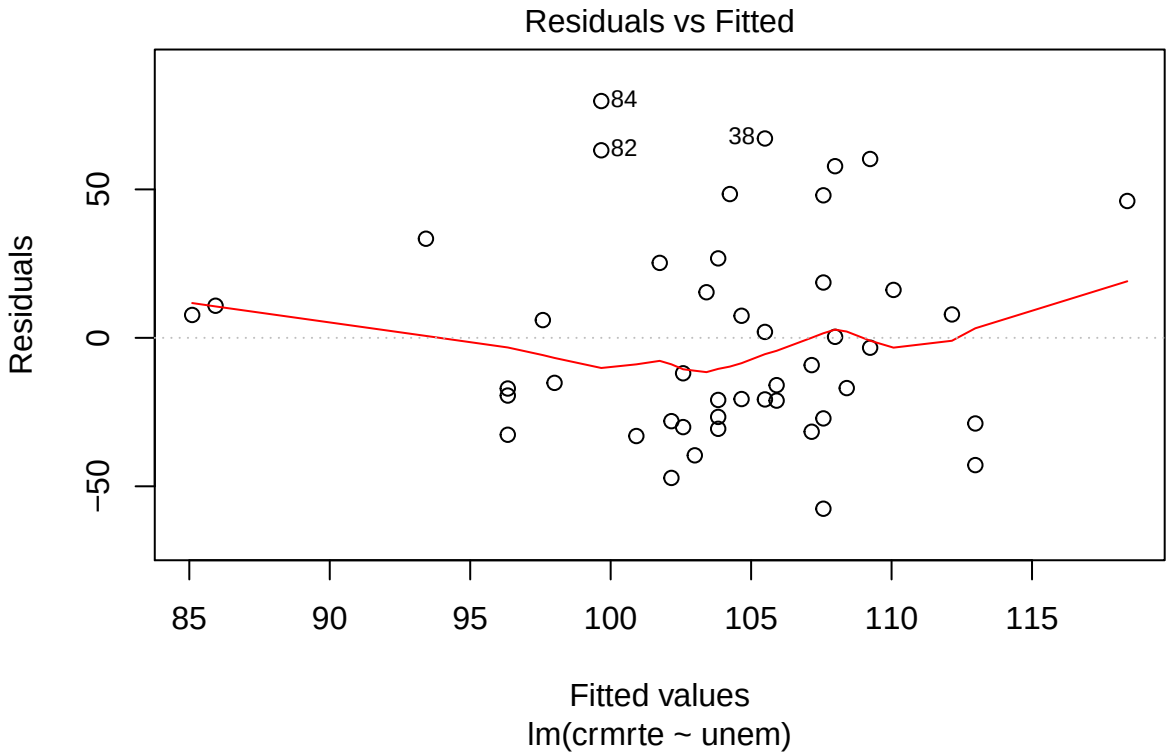
The residual-fitted plot shows that the residuals are heteroskedastic, and the Q-Q plot shows that the response is not a normal random variable. The residuals-leverage plot which shows a few residuals with high leverage.

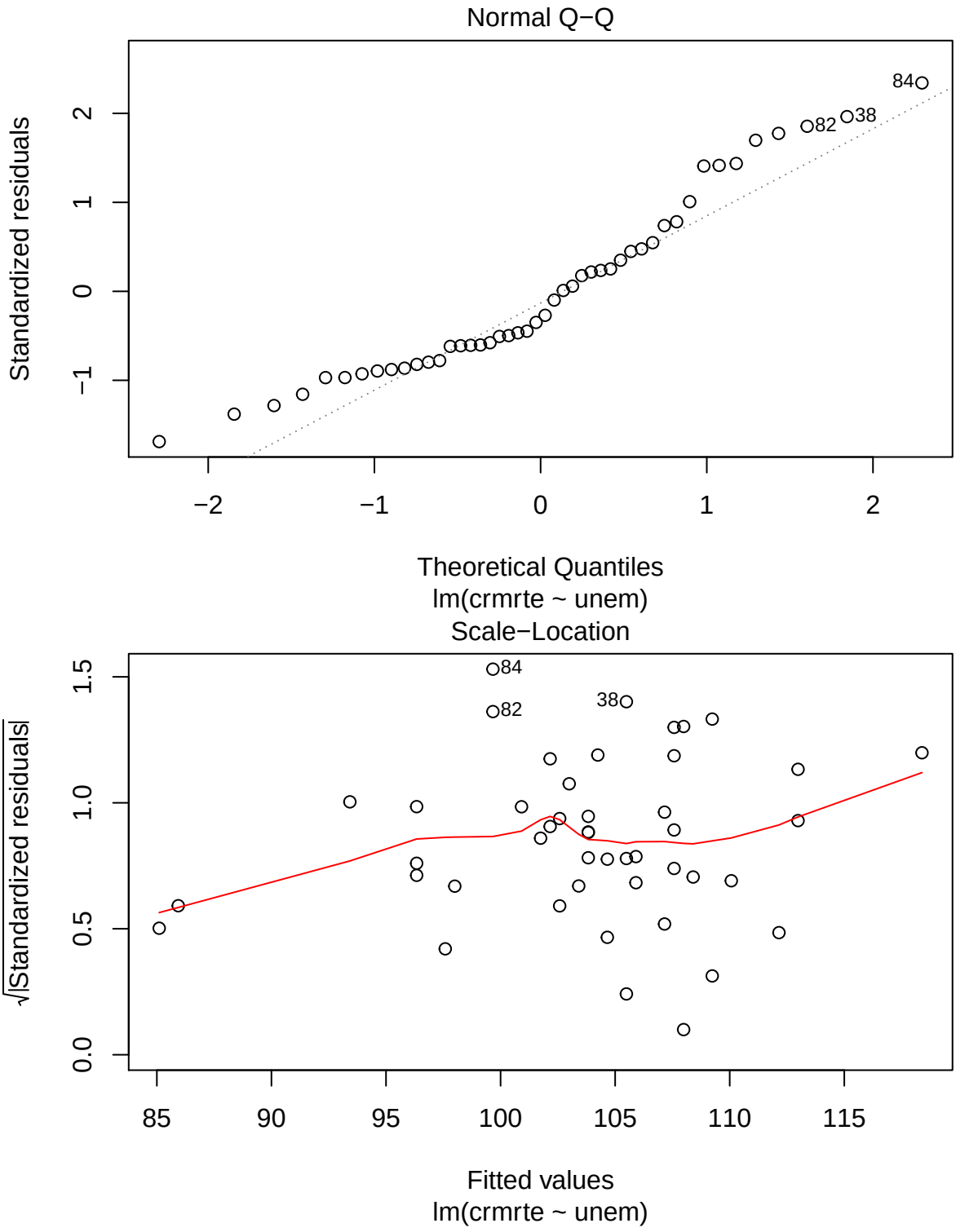
The negative coefficient for unemployment does not make sense as we would expect unemployment and crime rates to be positively correlated.

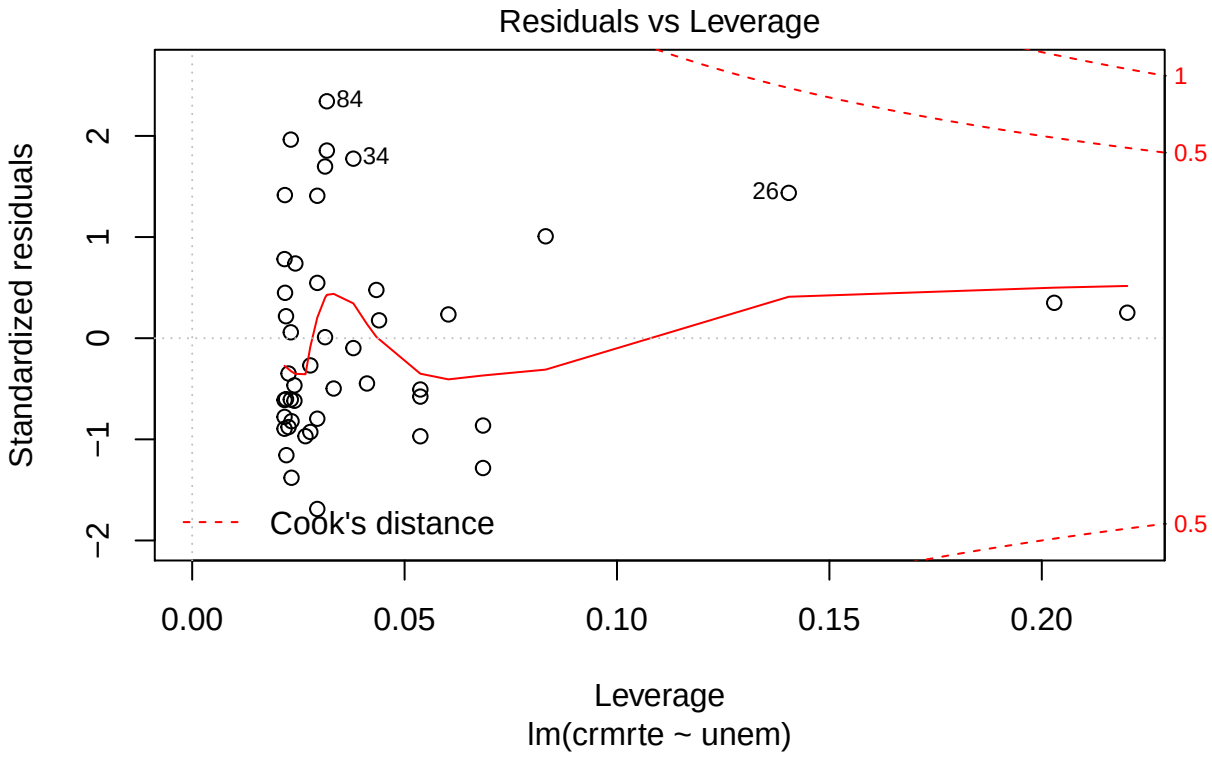
```r
# summary(crime2)

crimes.87 = crime2[crime2$year==87,]
ols.fit2 = lm(crmrte ~ unem, data = crimes.87)
summary(ols.fit2)
```

```
##
## Call:
## lm(formula = crmrte ~ unem, data = crimes.87)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -57.55 -27.01 -10.56  18.01  79.75
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  128.378     20.757   6.185  1.8e-07 ***
## unem          -4.161      3.416  -1.218     0.23
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 34.6 on 44 degrees of freedom
## Multiple R-squared:  0.03262,    Adjusted R-squared:  0.01063
## F-statistic: 1.483 on 1 and 44 DF,  p-value: 0.2297
```

```r
plot(ols.fit2)
```




Normal Q−Q
Standardized residuals
Theoretical Quantiles
lm(crmrte ~ unem)
84
82
38
−2
−1
0
1
2
Scale−Location
√|Standardized residuals|
Fitted values
lm(crmrte ~ unem)
0.0
0.5
1.0
1.5
85
90
95
100
105
110
115


Residuals vs Leverage
Standardized residuals
Leverage
lm(crmrte ~ unem)
Cook's distance
84
34
26
1
0.5
0.5
2
1
0
−1
−2
0.00
0.05
0.10
0.15
0.20