```
# Blatt 6, Aufgabe 2

#a)
daten = read.table("C:/Users/Bjoern/Desktop/Eigene Dateien/Lehre/2015 SS/Oekonometrie/Blatt
6/crime.txt", header=TRUE, sep=";")
daten = cbind(daten, "j82"=(daten$jahr==82))
daten = cbind(daten, "j83"=(daten$jahr==83))
daten = cbind(daten, "j84"=(daten$jahr==84))
daten = cbind(daten, "j85"=(daten$jahr==85))
daten = cbind(daten, "j86"=(daten$jahr==86))
daten = cbind(daten, "j87"=(daten$jahr==87))

daten[,3:8] = log(daten[,3:8])

print(summary(lm(data=daten,formula=rate~1+j82+j83+j84+j85+j86+j87+wverh+wverur+whaft+laenge+p
ol)))

#b)
data_dif = c()

for(i in 1:length(daten$rate)){
  if(daten$jahr[i] != 81){
    data_dif = rbind(data_dif,daten[i,]-daten[i-1,])
  }
}
print(summary(lm(data=data_dif,formula=rate~0+j82+j83+j84+j85+j86+j87+wverh+wverur+whaft+laeng
e+pol)))

#d)
data_dif = cbind(data_dif, "j83neu"=(data_dif$j83==1))
data_dif = cbind(data_dif, "j84neu"=(data_dif$j84==1))
data_dif = cbind(data_dif, "j85neu"=(data_dif$j85==1))
data_dif = cbind(data_dif, "j86neu"=(data_dif$j86==1))
data_dif = cbind(data_dif, "j87neu"=(data_dif$j87==1))

print(summary(lm(data=data_dif,formula=rate~1+j83neu+j84neu+j85neu+j86neu+j87neu+wverh+wverur+
whaft+laenge+pol)))


#Ausgabe:

Call:
lm(formula = rate ~ 1 + j82 + j83 + j84 + j85 + j86 + j87 + wverh +
    wverur + whaft + laenge + pol, data = daten)

Residuals:
     Min       1Q   Median       3Q      Max
-1.89966 -0.18748  0.02896  0.23189  1.31319

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -2.082303   0.251625  -8.275  7.9e-16 ***
j82TRUE      0.005137   0.057931   0.089 0.929370
j83TRUE     -0.043503   0.057624  -0.755 0.450575
j84TRUE     -0.108753   0.057923  -1.878 0.060914 .
j85TRUE     -0.078042   0.058324  -1.338 0.181365
```

```
j86TRUE     -0.042077   0.057822  -0.728 0.467068
j87TRUE     -0.027042   0.056899  -0.475 0.634771
wverh       -0.719503   0.036766 -19.570  < 2e-16 ***
wverur      -0.545659   0.026368 -20.694  < 2e-16 ***
whaft        0.247551   0.067227   3.682 0.000251 ***
laenge      -0.086755   0.057920  -1.498 0.134686
pol          0.365988   0.030025  12.189  < 2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.3789 on 618 degrees of freedom
Multiple R-squared:  0.57,  Adjusted R-squared: 0.5624
F-statistic: 74.49 on 11 and 618 DF,  p-value: < 2.2e-16

[1]
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Call:
lm(formula = rate ~ 0 + j82 + j83 + j84 + j85 + j86 + j87 + wverh +
    wverur + whaft + laenge + pol, data = data_dif)

Residuals:
     Min       1Q   Median       3Q      Max
-0.65935 -0.07838  0.00296  0.07503  0.68306

Coefficients:
        Estimate Std. Error t value Pr(>|t|)
j82     0.007713   0.017058   0.452 0.651326
j83    -0.084439   0.023456  -3.600 0.000348 ***
j84    -0.124662   0.028746  -4.337 1.73e-05 ***
j85    -0.121558   0.033150  -3.667 0.000270 ***
j86    -0.086331   0.036676  -2.354 0.018944 *
j87    -0.037792   0.039973  -0.945 0.344860
wverh  -0.327494   0.029980 -10.924  < 2e-16 ***
wverur -0.238107   0.018234 -13.058  < 2e-16 ***
whaft  -0.165047   0.025969  -6.356 4.49e-10 ***
laenge -0.021759   0.022091  -0.985 0.325094
pol     0.398425   0.026882  14.821  < 2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.1543 on 529 degrees of freedom
Multiple R-squared: 0.4326, Adjusted R-squared: 0.4208
F-statistic: 36.66 on 11 and 529 DF,  p-value: < 2.2e-16

[1]
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Call:
lm(formula = rate ~ 1 + j83neu + j84neu + j85neu + j86neu + j87neu +
    wverh + wverur + whaft + laenge + pol, data = data_dif)

Residuals:
     Min       1Q   Median       3Q      Max
-0.65935 -0.07838  0.00296  0.07503  0.68306

Coefficients:
```

```
             Estimate Std. Error t value Pr(>|t|)
(Intercept)  0.007713   0.017058   0.452   0.6513
j83neuTRUE  -0.099865   0.023895  -4.179 3.42e-05 ***
j84neuTRUE  -0.047937   0.023502  -2.040   0.0419 *
j85neuTRUE  -0.004609   0.023500  -0.196   0.8446
j86neuTRUE   0.027513   0.024149   1.139   0.2551
j87neuTRUE   0.040826   0.024415   1.672   0.0951 .
wverh       -0.327494   0.029980 -10.924  < 2e-16 ***
wverur      -0.238107   0.018234 -13.058  < 2e-16 ***
whaft       -0.165047   0.025969  -6.356 4.49e-10 ***
laenge      -0.021759   0.022091  -0.985   0.3251
pol          0.398425   0.026882  14.821  < 2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.1543 on 529 degrees of freedom
Multiple R-squared: 0.4325, Adjusted R-squared: 0.4218
F-statistic: 40.32 on 10 and 529 DF,  p-value: < 2.2e-16
```

```
#Blatt 6, Aufgabe 3

#b)
rental = read.table("C:/Users/Bjoern/Desktop/Eigene Dateien/Lehre/2015 SS/Oekonometrie/Blatt
6/rental.txt", header=TRUE, sep=";")

dim = length(rental$jahr)
Y = rep(0,dim)
Y_mean = rep(0,dim)
X = matrix(0, dim, 4)
X_mean = matrix(0, dim, 4)

Y = log(rental$miete)
X[,1] = rental$j90
X[,2] = log(rental$bev)
X[,3] = log(rental$eink)
X[,4] = rental$stud

for(i in 1:dim){
  if(rental$jahr[i] == 80){
    Y_mean[i] = mean(c(Y[i], Y[i+1]))
    X_mean[i,1] = mean(c(X[i,1], X[i+1,1]))
    X_mean[i,2] = mean(c(X[i,2], X[i+1,2]))
    X_mean[i,3] = mean(c(X[i,3], X[i+1,3]))
    X_mean[i,4] = mean(c(X[i,4], X[i+1,4]))
  }else{
    Y_mean[i] = mean(c(Y[i], Y[i-1]))
    X_mean[i,1] = mean(c(X[i,1], X[i-1,1]))
    X_mean[i,2] = mean(c(X[i,2], X[i-1,2]))
    X_mean[i,3] = mean(c(X[i,3], X[i-1,3]))
    X_mean[i,4] = mean(c(X[i,4], X[i-1,4]))
  }
}
X_b = X-X_mean
```

```
Y_b = Y-Y_mean
XtX_inv = solve(t(X_b)%*%X_b)
beta = XtX_inv%*%t(X_b)%*%Y_b
print(beta)
print("")

Y_hat = X_b%*%beta
s = sqrt(sum((Y_b-Y_hat)^2)/(dim/2-4))
test = (beta[1])/(s*sqrt(XtX_inv[1,1]))
print(test)
if(test > qt(0.99, (dim/2)-4)){
  print("H0 wird verworfen")
}else{
  print("H0 wird nicht verworfen")
}
print("")



#c)
pooled = lm(data=rental, formula=log(miete)~1+j90+log(bev)+log(eink)+stud)
v = pooled$residuals
s2 = sum(v^2)/pooled$df.residual


sigma_a2 = 0
for(i in 1:(dim/2)){
  sigma_a2 = sigma_a2 + v[2*i-1]*v[2*i]
}

sigma_a2 = sigma_a2/(dim/2-5)
sigma_u2 = s2-sigma_a2
lambda = 1-sqrt(sigma_u2/(sigma_u2+2*sigma_a2))
print(lambda)
l=rep(1-lambda, dim)

print(summary(lm(
I(Y-lambda*Y_mean)~0+l+I(X[,1]-lambda*X_mean[,1])+I(X[,2]-lambda*X_mean[,2])+I(X[,3]-lambda*X_
mean[,3])+I(X[,4]-lambda*X_mean[,4]) )))
print("=============================================================================
=====")



#d)
form = log(miete)~1+j90+log(bev)+log(eink)+stud

print(summary(plm(form, data=rental, model="pooling")))
print("=============================================================================
=====")
print(summary(plm(form, data=rental, model="fd")))
print("=============================================================================
=====")
fe = plm(form, data=rental, model="within")
print(summary(fe))
print("=============================================================================
=====")
re = plm(form, data=rental, model="random")
print(summary(re))
```

```
print("================================================================================
=====")


#e)
print(phtest(fe,re))


#Ausgabe

           [,1]
[1,] 0.38552143
[2,] 0.07224576
[3,] 0.30996043
[4,] 0.01120331
[1] ""
[1] 10.46917
[1] "H0 wird verworfen"
[1] ""
        1
0.5823948

Call:
lm(formula = I(Y - lambda * Y_mean) ~ 0 + l + I(X[, 1] - lambda *
    X_mean[, 1]) + I(X[, 2] - lambda * X_mean[, 2]) + I(X[, 3] -
    lambda * X_mean[, 3]) + I(X[, 4] - lambda * X_mean[, 4]))

Residuals:
      Min        1Q    Median        3Q       Max
-0.144868 -0.047387 -0.004544  0.028615  0.283496

Coefficients:
                                  Estimate Std. Error t value Pr(>|t|)
l                                 0.255668   0.403226   0.634 0.527222
I(X[, 1] - lambda * X_mean[, 1]) 0.317839   0.028937  10.984  < 2e-16 ***
I(X[, 2] - lambda * X_mean[, 2]) 0.054463   0.027979   1.947 0.053869 .
I(X[, 3] - lambda * X_mean[, 3]) 0.458265   0.052026   8.808 9.88e-15 ***
I(X[, 4] - lambda * X_mean[, 4]) 0.005100   0.001269   4.020 0.000101 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.06863 on 123 degrees of freedom
Multiple R-squared: 0.9992, Adjusted R-squared: 0.9992
F-statistic: 3.174e+04 on 5 and 123 DF,  p-value: < 2.2e-16

[1]
"================================================================================"
Oneway (individual) effect Pooling Model

Call:
plm(formula = form, data = rental, model = "pooling")

Balanced Panel: n=64, T=2, N=128

Residuals :
   Min. 1st Qu.  Median 3rd Qu.    Max.
-0.2420 -0.0782 -0.0164  0.0439  0.4810
```

```
Coefficients :
              Estimate Std. Error t-value  Pr(>|t|)
(Intercept) -0.5688065  0.5348806 -1.0634    0.2897
j90          0.2622267  0.0347632  7.5432 8.781e-12 ***
log(bev)     0.0406863  0.0225154  1.8070    0.0732 .
log(eink)    0.5714461  0.0530980 10.7621 < 2.2e-16 ***
stud         0.0050436  0.0010192  4.9486 2.401e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares:    14.058
Residual Sum of Squares: 1.9501
R-Squared      :  0.86128
      Adj. R-Squared :  0.82764
F-statistic: 190.922 on 4 and 123 DF, p-value: < 2.22e-16
[1]
"================================================================================================="
Oneway (individual) effect First-Difference Model

Call:
plm(formula = form, data = rental, model = "fd")

Balanced Panel: n=64, T=2, N=128

Residuals :
   Min. 1st Qu.  Median 3rd Qu.    Max.
-0.1870 -0.0622 -0.0144  0.0552  0.2380

Coefficients :
             Estimate Std. Error t-value  Pr(>|t|)
(intercept) 0.3855214  0.0368245 10.4692 3.661e-15 ***
log(bev)    0.0722458  0.0883426  0.8178  0.416712
log(eink)   0.3099604  0.0664771  4.6627 1.788e-05 ***
stud        0.0112033  0.0041319  2.7114  0.008726 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares:    0.7191
Residual Sum of Squares: 0.48736
R-Squared      :  0.32226
      Adj. R-Squared :  0.30212
F-statistic: 9.50992 on 3 and 60 DF, p-value: 3.1362e-05
[1]
"================================================================================================="
Oneway (individual) effect Within Model

Call:
plm(formula = form, data = rental, model = "within")

Balanced Panel: n=64, T=2, N=128

Residuals :
     Min.   1st Qu.    Median   3rd Qu.      Max.
-1.19e-01 -2.96e-02  7.82e-16  2.96e-02  1.19e-01

Coefficients :
```

```
            Estimate Std. Error t-value  Pr(>|t|)
j90        0.3855214  0.0368245 10.4692 3.661e-15 ***
log(bev)   0.0722458  0.0883426  0.8178  0.416712
log(eink)  0.3099604  0.0664771  4.6627 1.788e-05 ***
stud       0.0112033  0.0041319  2.7114  0.008726 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares:    10.383
Residual Sum of Squares: 0.24368
R-Squared      :  0.97653
      Adj. R-Squared :  0.45775
F-statistic: 624.147 on 4 and 60 DF, p-value: < 2.22e-16
[1]
"================================================================================================="
Oneway (individual) effect Random Effect Model
   (Swamy-Aroras transformation)

Call:
plm(formula = form, data = rental, model = "random")

Balanced Panel: n=64, T=2, N=128

Effects:
                   var  std.dev share
idiosyncratic 0.004061 0.063729 0.261
individual    0.011473 0.107111 0.739
theta:  0.6122

Residuals :
    Min.  1st Qu.   Median  3rd Qu.     Max.
-0.14100 -0.04650 -0.00395  0.02730  0.27200

Coefficients :
             Estimate Std. Error t-value  Pr(>|t|)
(Intercept) 0.4451214  0.5663044  0.7860 0.4333727
j90         0.3233674  0.0286635 11.2815 < 2.2e-16 ***
log(bev)    0.0561725  0.0287667  1.9527 0.0531277 .
log(eink)   0.4468825  0.0518013  8.6269 2.659e-14 ***
stud        0.0051397  0.0013049  3.9387 0.0001364 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares:    10.936
Residual Sum of Squares: 0.53703
R-Squared      :  0.95089
      Adj. R-Squared :  0.91375
F-statistic: 595.427 on 4 and 123 DF, p-value: < 2.22e-16
[1]
"================================================================================================="

    Hausman Test

data:  form
chisq = 13.2716, df = 4, p-value = 0.01002
alternative hypothesis: one model is inconsistent
```