Yassine-PhD.R

LOKMAN

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library(plm)

## Warning: package 'plm' was built under R version 4.0.5

library(readxl)

## Warning: package 'readxl' was built under R version 4.0.5

library(clubSandwich)

## Registered S3 method overwritten by 'clubSandwich':  
## method from   
## bread.mlm sandwich

library(lmtest)

## Loading required package: zoo

##   
## Attaching package: 'zoo'

## The following objects are masked from 'package:base':  
##   
## as.Date, as.Date.numeric

library(performance)  
  
  
Panel\_data <- read\_excel("C:/Users/LOKMAN/Desktop/Yassine PhD/Panel\_data.xlsx",   
 sheet = "Data\_2")  
  
data<-pdata.frame(Panel\_data, index=c("ID", "Year"))  
View(data)  
  
form<-ROA ~ RSE+TAILLE+RISQUE  
# Modele de regression estime par la methode des MCO   
MCO1 <- plm(form,data = data,   
 model = "pooling",effect = "twoways")  
summary(MCO1)

## Pooling Model  
##   
## Call:  
## plm(formula = form, data = data, effect = "twoways", model = "pooling")  
##   
## Balanced Panel: n = 3, T = 10, N = 30  
##   
## Residuals:  
## Min. 1st Qu. Median 3rd Qu. Max.   
## -0.047737 -0.030139 -0.013781 0.012611 0.137407   
##   
## Coefficients:  
## Estimate Std. Error t-value Pr(>|t|)   
## (Intercept) 1.4106e-01 1.9564e-02 7.2101 1.173e-07 \*\*\*  
## RSE 5.8100e-02 1.9023e-02 3.0542 0.005158 \*\*   
## TAILLE -1.3474e-05 5.4805e-06 -2.4586 0.020925 \*   
## RISQUE -3.3371e-04 2.2623e-04 -1.4751 0.152193   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Total Sum of Squares: 0.095016  
## Residual Sum of Squares: 0.061285  
## R-Squared: 0.355  
## Adj. R-Squared: 0.28058  
## F-statistic: 4.77 on 3 and 26 DF, p-value: 0.0088503

# Modele a effets fixes   
FE1 <- plm(form,data = data,   
 model = "within")  
summary(FE1)

## Oneway (individual) effect Within Model  
##   
## Call:  
## plm(formula = form, data = data, model = "within")  
##   
## Balanced Panel: n = 3, T = 10, N = 30  
##   
## Residuals:  
## Min. 1st Qu. Median 3rd Qu. Max.   
## -0.055778 -0.027712 -0.010764 0.016624 0.116764   
##   
## Coefficients:  
## Estimate Std. Error t-value Pr(>|t|)  
## RSE 3.0566e-02 2.2411e-02 1.3639 0.1853  
## TAILLE 1.6277e-05 1.3667e-05 1.1909 0.2453  
## RISQUE -4.1792e-05 3.1989e-04 -0.1306 0.8971  
##   
## Total Sum of Squares: 0.061619  
## Residual Sum of Squares: 0.047194  
## R-Squared: 0.2341  
## Adj. R-Squared: 0.074535  
## F-statistic: 2.4452 on 3 and 24 DF, p-value: 0.088527

# Modele a effets aleatoires   
random <- plm(ROA ~ RSE+TAILLE+RISQUE, data = data,   
 random.method="swar",effect = "twoways")  
summary(random)

## Twoways effects Within Model  
##   
## Call:  
## plm(formula = ROA ~ RSE + TAILLE + RISQUE, data = data, effect = "twoways",   
## random.method = "swar")  
##   
## Balanced Panel: n = 3, T = 10, N = 30  
##   
## Residuals:  
## Min. 1st Qu. Median 3rd Qu. Max.   
## -0.0501201 -0.0195968 -0.0038894 0.0178011 0.0835009   
##   
## Coefficients:  
## Estimate Std. Error t-value Pr(>|t|)  
## RSE 0.00619793 0.03927241 0.1578 0.8767  
## TAILLE 0.00001196 0.00001904 0.6282 0.5393  
## RISQUE -0.00023228 0.00050672 -0.4584 0.6532  
##   
## Total Sum of Squares: 0.03949  
## Residual Sum of Squares: 0.035528  
## R-Squared: 0.10034  
## Adj. R-Squared: -0.73934  
## F-statistic: 0.557665 on 3 and 15 DF, p-value: 0.65101

# Modele a effets fixes VS modele a effets aleatoires Haussman   
phtest(FE1,random, vcov = "vcovHC")

##   
## Hausman Test  
##   
## data: form  
## chisq = 0.69769, df = 3, p-value = 0.8737  
## alternative hypothesis: one model is inconsistent

# Modele estime par la methode des MCO versus modele a effets aleatoires  
plmtest(MCO1, effect="twoways", type="bp")

##   
## Lagrange Multiplier Test - two-ways effects (Breusch-Pagan) for  
## balanced panels  
##   
## data: form  
## chisq = 1.2842, df = 2, p-value = 0.5262  
## alternative hypothesis: significant effects

# Modele estime par la methode des MCO versus modele a effets fixes  
pFtest(FE1, MCO1)

##   
## F test for individual effects  
##   
## data: form  
## F = 3.5831, df1 = 2, df2 = 24, p-value = 0.04348  
## alternative hypothesis: significant effects

# Ajustement du modele choisi  
  
# Test d'heteroscedasticite  
bptest(ROA ~ RSE+TAILLE+RISQUE+factor(ID), data = Panel\_data, studentize = F)

##   
## Breusch-Pagan test  
##   
## data: ROA ~ RSE + TAILLE + RISQUE + factor(ID)  
## BP = 12.244, df = 5, p-value = 0.03159

# Test d'autocorrelation  
pdwtest(random, alternative="two.sided")

##   
## Durbin-Watson test for serial correlation in panel models  
##   
## data: ROA ~ RSE + TAILLE + RISQUE  
## DW = 1.6322, p-value = 0.2338  
## alternative hypothesis: serial correlation in idiosyncratic errors

# Breusch-Godfrey/Wooldridge test for serial correlation  
pbgtest(random)

##   
## Breusch-Godfrey/Wooldridge test for serial correlation in panel models  
##   
## data: ROA ~ RSE + TAILLE + RISQUE  
## chisq = 9.6107, df = 10, p-value = 0.4753  
## alternative hypothesis: serial correlation in idiosyncratic errors

# Test de multicolinearite  
  
check\_collinearity(MCO1)

## # Check for Multicollinearity  
##   
## Low Correlation  
##   
## Parameter VIF Increased SE  
## RSE 1.11 1.06  
## TAILLE 1.12 1.06  
## RISQUE 1.01 1.00

# Resultats du modele ajuste  
  
coeftest(MCO1, vcov.=function(x) vcovHC(x, method="arellano",  
 type="HC0", cluster="group"))

##   
## t test of coefficients:  
##   
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 1.4106e-01 1.0600e-02 13.3066 4.104e-13 \*\*\*  
## RSE 5.8100e-02 3.3164e-02 1.7519 0.09158 .   
## TAILLE -1.3474e-05 1.5257e-06 -8.8313 2.638e-09 \*\*\*  
## RISQUE -3.3371e-04 2.1559e-04 -1.5479 0.13373   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

#...........................Model 2.............  
  
form2<-ROE ~ RSE+TAILLE+RISQUE  
# Modele de regression estime par la methode des MCO   
MCO2 <- plm(form2,data = data,   
 model = "pooling",effect = "twoways")  
summary(MCO2)

## Pooling Model  
##   
## Call:  
## plm(formula = form2, data = data, effect = "twoways", model = "pooling")  
##   
## Balanced Panel: n = 3, T = 10, N = 30  
##   
## Residuals:  
## Min. 1st Qu. Median 3rd Qu. Max.   
## -0.159348 -0.039586 -0.010593 0.037797 0.235794   
##   
## Coefficients:  
## Estimate Std. Error t-value Pr(>|t|)   
## (Intercept) 3.4506e-01 3.4571e-02 9.9812 2.205e-10 \*\*\*  
## RSE 1.4265e-01 3.3616e-02 4.2435 0.0002471 \*\*\*  
## TAILLE -5.2887e-05 9.6845e-06 -5.4610 9.998e-06 \*\*\*  
## RISQUE 9.5047e-05 3.9977e-04 0.2378 0.8139364   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Total Sum of Squares: 0.46474  
## Residual Sum of Squares: 0.19137  
## R-Squared: 0.58821  
## Adj. R-Squared: 0.5407  
## F-statistic: 12.3797 on 3 and 26 DF, p-value: 3.2187e-05

# Modele a effets fixes   
FE2 <- plm(form2,data = data, model = "within")  
summary(FE2)

## Oneway (individual) effect Within Model  
##   
## Call:  
## plm(formula = form2, data = data, model = "within")  
##   
## Balanced Panel: n = 3, T = 10, N = 30  
##   
## Residuals:  
## Min. 1st Qu. Median 3rd Qu. Max.   
## -0.1785933 -0.0188109 0.0010934 0.0205824 0.2217305   
##   
## Coefficients:  
## Estimate Std. Error t-value Pr(>|t|)   
## RSE 8.8426e-02 3.8825e-02 2.2776 0.03195 \*  
## TAILLE 1.2957e-06 2.3677e-05 0.0547 0.95681   
## RISQUE 5.8502e-04 5.5417e-04 1.0557 0.30163   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Total Sum of Squares: 0.17611  
## Residual Sum of Squares: 0.14164  
## R-Squared: 0.19573  
## Adj. R-Squared: 0.028177  
## F-statistic: 1.94694 on 3 and 24 DF, p-value: 0.14899

# Modele a effets aleatoires   
random2 <- plm(form2, data = data, random.method="swar"  
 ,effect = "twoways")  
summary(random2)

## Twoways effects Within Model  
##   
## Call:  
## plm(formula = form2, data = data, effect = "twoways", random.method = "swar")  
##   
## Balanced Panel: n = 3, T = 10, N = 30  
##   
## Residuals:  
## Min. 1st Qu. Median 3rd Qu. Max.   
## -0.116377 -0.035498 0.005813 0.025821 0.142822   
##   
## Coefficients:  
## Estimate Std. Error t-value Pr(>|t|)  
## RSE 2.6784e-02 6.1043e-02 0.4388 0.6671  
## TAILLE -2.6221e-05 2.9595e-05 -0.8860 0.3896  
## RISQUE 6.8150e-05 7.8763e-04 0.0865 0.9322  
##   
## Total Sum of Squares: 0.094481  
## Residual Sum of Squares: 0.085836  
## R-Squared: 0.091501  
## Adj. R-Squared: -0.75643  
## F-statistic: 0.503585 on 3 and 15 DF, p-value: 0.68557

# Modele a effets fixes VS modele a effets aleatoires Haussman   
phtest(FE2,random2, vcov = "vcovHC")

##   
## Hausman Test  
##   
## data: form2  
## chisq = 3.1632, df = 3, p-value = 0.3671  
## alternative hypothesis: one model is inconsistent

# Modele estime par la methode des MCO versus modele a effets aleatoires  
plmtest(MCO2, effect="twoways", type="bp")

##   
## Lagrange Multiplier Test - two-ways effects (Breusch-Pagan) for  
## balanced panels  
##   
## data: form2  
## chisq = 0.098289, df = 2, p-value = 0.952  
## alternative hypothesis: significant effects

# Modele estime par la methode desMCO versus modele a effets fixes  
pFtest(FE2, MCO2)

##   
## F test for individual effects  
##   
## data: form2  
## F = 4.2139, df1 = 2, df2 = 24, p-value = 0.02701  
## alternative hypothesis: significant effects

# Ajustement du modele choisi  
  
# Test d'heteroscedasticite  
library(lmtest)  
bptest(ROE ~ RSE+TAILLE+RISQUE+factor(ID), data = Panel\_data, studentize = F)

##   
## Breusch-Pagan test  
##   
## data: ROE ~ RSE + TAILLE + RISQUE + factor(ID)  
## BP = 27.392, df = 5, p-value = 4.784e-05

# Test d'autocorrelation  
pdwtest(random2, alternative="two.sided")

##   
## Durbin-Watson test for serial correlation in panel models  
##   
## data: form2  
## DW = 1.1281, p-value = 0.007059  
## alternative hypothesis: serial correlation in idiosyncratic errors

# Breusch-Godfrey/Wooldridge test for serial correlation  
pbgtest(random2)

##   
## Breusch-Godfrey/Wooldridge test for serial correlation in panel models  
##   
## data: form2  
## chisq = 19.293, df = 10, p-value = 0.03669  
## alternative hypothesis: serial correlation in idiosyncratic errors

# Test de multicolinearite  
library(performance)  
check\_collinearity(MCO2)

## # Check for Multicollinearity  
##   
## Low Correlation  
##   
## Parameter VIF Increased SE  
## RSE 1.11 1.06  
## TAILLE 1.12 1.06  
## RISQUE 1.01 1.00

# Resultats du modele ajuste  
  
coeftest(MCO2, vcov.=function(x) vcovHC(x, method="arellano",  
 type="HC0", cluster="group"))

##   
## t test of coefficients:  
##   
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 3.4506e-01 2.8167e-02 12.2506 2.648e-12 \*\*\*  
## RSE 1.4265e-01 2.8792e-02 4.9546 3.789e-05 \*\*\*  
## TAILLE -5.2887e-05 8.9511e-06 -5.9085 3.119e-06 \*\*\*  
## RISQUE 9.5047e-05 3.3102e-04 0.2871 0.7763   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

#...........................Model 3.............  
  
form3<-ROS ~ RSE+TAILLE+RISQUE  
# Modele de regression estime par la methode des MCO   
MCO3 <- plm(form3,data = data,   
 model = "pooling",effect = "twoways")  
summary(MCO3)

## Pooling Model  
##   
## Call:  
## plm(formula = form3, data = data, effect = "twoways", model = "pooling")  
##   
## Balanced Panel: n = 3, T = 10, N = 30  
##   
## Residuals:  
## Min. 1st Qu. Median 3rd Qu. Max.   
## -0.0843632 -0.0284441 0.0067134 0.0270490 0.0595377   
##   
## Coefficients:  
## Estimate Std. Error t-value Pr(>|t|)   
## (Intercept) 2.0569e-02 1.4904e-02 1.3800 0.1793320   
## RSE 1.7732e-02 1.4493e-02 1.2235 0.2321065   
## TAILLE 1.8342e-05 4.1752e-06 4.3931 0.0001668 \*\*\*  
## RISQUE 1.2174e-04 1.7235e-04 0.7064 0.4862424   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Total Sum of Squares: 0.073785  
## Residual Sum of Squares: 0.03557  
## R-Squared: 0.51792  
## Adj. R-Squared: 0.4623  
## F-statistic: 9.31099 on 3 and 26 DF, p-value: 0.00023611

# Modele a effets fixes   
FE3 <- plm(form3,data = data,   
 model = "within")  
summary(FE3)

## Oneway (individual) effect Within Model  
##   
## Call:  
## plm(formula = form3, data = data, model = "within")  
##   
## Balanced Panel: n = 3, T = 10, N = 30  
##   
## Residuals:  
## Min. 1st Qu. Median 3rd Qu. Max.   
## -0.0460260 -0.0077806 0.0044748 0.0130150 0.0450223   
##   
## Coefficients:  
## Estimate Std. Error t-value Pr(>|t|)   
## RSE 6.5648e-02 1.1775e-02 5.5752 9.768e-06 \*\*\*  
## TAILLE 6.1585e-06 7.1811e-06 0.8576 0.39959   
## RISQUE 3.7654e-04 1.6807e-04 2.2404 0.03459 \*   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Total Sum of Squares: 0.033062  
## Residual Sum of Squares: 0.013028  
## R-Squared: 0.60594  
## Adj. R-Squared: 0.52385  
## F-statistic: 12.3016 on 3 and 24 DF, p-value: 4.5049e-05

# Modele a effets aleatoires   
random3 <- plm(form3, data = data,   
 random.method="swar",effect = "twoways")  
summary(random3)

## Twoways effects Within Model  
##   
## Call:  
## plm(formula = form3, data = data, effect = "twoways", random.method = "swar")  
##   
## Balanced Panel: n = 3, T = 10, N = 30  
##   
## Residuals:  
## Min. 1st Qu. Median 3rd Qu. Max.   
## -0.0294750 -0.0094956 -0.0029120 0.0118674 0.0222370   
##   
## Coefficients:  
## Estimate Std. Error t-value Pr(>|t|)   
## RSE 5.6962e-02 1.5444e-02 3.6882 0.002191 \*\*  
## TAILLE -7.2146e-07 7.4876e-06 -0.0964 0.924515   
## RISQUE 1.6758e-04 1.9927e-04 0.8409 0.413593   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Total Sum of Squares: 0.010547  
## Residual Sum of Squares: 0.0054945  
## R-Squared: 0.47906  
## Adj. R-Squared: -0.0071594  
## F-statistic: 4.59795 on 3 and 15 DF, p-value: 0.017887

# Modele a effets fixes VS modele a effets aleatoires Haussman   
phtest(FE3,random3, vcov = "vcovHC")

##   
## Hausman Test  
##   
## data: form3  
## chisq = 3.047, df = 3, p-value = 0.3844  
## alternative hypothesis: one model is inconsistent

# Modele estime par la methode des MCO versus modele a effets aleatoires  
plmtest(MCO3, effect="twoways", type="bp")

##   
## Lagrange Multiplier Test - two-ways effects (Breusch-Pagan) for  
## balanced panels  
##   
## data: form3  
## chisq = 8.435, df = 2, p-value = 0.01474  
## alternative hypothesis: significant effects

# Modele estime par la methode des MCO versus modele a effets fixes  
pFtest(FE3, MCO3)

##   
## F test for individual effects  
##   
## data: form3  
## F = 20.763, df1 = 2, df2 = 24, p-value = 5.829e-06  
## alternative hypothesis: significant effects

# Ajustement du modele choisi  
  
# Test d'heteroscedasticite  
library(lmtest)  
bptest(form3, data = data, studentize = F)

##   
## Breusch-Pagan test  
##   
## data: form3  
## BP = 8.3175, df = 3, p-value = 0.03989

# Test d'autocorrelation  
pdwtest(random3, alternative="two.sided")

##   
## Durbin-Watson test for serial correlation in panel models  
##   
## data: form3  
## DW = 1.7693, p-value = 0.4201  
## alternative hypothesis: serial correlation in idiosyncratic errors

# Breusch-Godfrey/Wooldridge test for serial correlation  
pbgtest(random3)

##   
## Breusch-Godfrey/Wooldridge test for serial correlation in panel models  
##   
## data: form3  
## chisq = 16.442, df = 10, p-value = 0.08765  
## alternative hypothesis: serial correlation in idiosyncratic errors

# Test de multicolinearite  
library(performance)  
check\_collinearity(MCO3)

## # Check for Multicollinearity  
##   
## Low Correlation  
##   
## Parameter VIF Increased SE  
## RSE 1.11 1.06  
## TAILLE 1.12 1.06  
## RISQUE 1.01 1.00

# Resultats du modele ajuste  
  
coeftest(random3, vcov.=function(x) vcovHC(x, method="arellano",  
 type="HC0", cluster="group"))

##   
## t test of coefficients:  
##   
## Estimate Std. Error t value Pr(>|t|)   
## RSE 5.6962e-02 1.2799e-02 4.4506 0.0004671 \*\*\*  
## TAILLE -7.2146e-07 1.4951e-06 -0.4826 0.6363772   
## RISQUE 1.6758e-04 7.2752e-05 2.3034 0.0359879 \*   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

#...........................Model 4.............  
  
form4<-ROCE ~ RSE+TAILLE+RISQUE  
# Modele de regression estime par la methode des MCO   
MCO4 <- plm(form4,data = data,   
 model = "pooling",effect = "twoways")  
summary(MCO4)

## Pooling Model  
##   
## Call:  
## plm(formula = form4, data = data, effect = "twoways", model = "pooling")  
##   
## Balanced Panel: n = 3, T = 10, N = 30  
##   
## Residuals:  
## Min. 1st Qu. Median 3rd Qu. Max.   
## -0.162204 -0.067064 -0.034671 0.039898 0.429557   
##   
## Coefficients:  
## Estimate Std. Error t-value Pr(>|t|)   
## (Intercept) 2.3681e-01 4.8102e-02 4.9232 4.116e-05 \*\*\*  
## RSE 4.5152e-02 4.6773e-02 0.9653 0.3433   
## TAILLE -1.7463e-05 1.3475e-05 -1.2960 0.2064   
## RISQUE 6.0703e-04 5.5623e-04 1.0913 0.2851   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Total Sum of Squares: 0.41449  
## Residual Sum of Squares: 0.37049  
## R-Squared: 0.10616  
## Adj. R-Squared: 0.0030276  
## F-statistic: 1.02936 on 3 and 26 DF, p-value: 0.39585

# Modele a effets fixes   
FE4 <- plm(form4,data = data,   
 model = "within")  
summary(FE4)

## Oneway (individual) effect Within Model  
##   
## Call:  
## plm(formula = form4, data = data, model = "within")  
##   
## Balanced Panel: n = 3, T = 10, N = 30  
##   
## Residuals:  
## Min. 1st Qu. Median 3rd Qu. Max.   
## -0.180863 -0.054102 -0.019058 0.026158 0.357663   
##   
## Coefficients:  
## Estimate Std. Error t-value Pr(>|t|)   
## RSE 2.9653e-02 5.4543e-02 0.5437 0.59169   
## TAILLE 6.8132e-05 3.3263e-05 2.0482 0.05163 .  
## RISQUE 2.0980e-03 7.7853e-04 2.6948 0.01266 \*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Total Sum of Squares: 0.37165  
## Residual Sum of Squares: 0.27954  
## R-Squared: 0.24785  
## Adj. R-Squared: 0.091149  
## F-statistic: 2.63614 on 3 and 24 DF, p-value: 0.072789

# Modele a effets aleatoires   
random4 <- plm(form4, data = data,   
 random.method="swar",effect = "twoways")  
summary(random4)

## Twoways effects Within Model  
##   
## Call:  
## plm(formula = form4, data = data, effect = "twoways", random.method = "swar")  
##   
## Balanced Panel: n = 3, T = 10, N = 30  
##   
## Residuals:  
## Min. 1st Qu. Median 3rd Qu. Max.   
## -0.163982 -0.042992 -0.015673 0.051121 0.262469   
##   
## Coefficients:  
## Estimate Std. Error t-value Pr(>|t|)   
## RSE -5.9990e-03 9.5051e-02 -0.0631 0.95051   
## TAILLE 7.2607e-05 4.6082e-05 1.5756 0.13597   
## RISQUE 2.3673e-03 1.2264e-03 1.9302 0.07271 .  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Total Sum of Squares: 0.26479  
## Residual Sum of Squares: 0.20812  
## R-Squared: 0.21405  
## Adj. R-Squared: -0.51951  
## F-statistic: 1.36169 on 3 and 15 DF, p-value: 0.29242

# Modele a effets fixes VS modele a effets aleatoires Haussman   
phtest(FE4,random4, vcov = "vcovHC")

##   
## Hausman Test  
##   
## data: form4  
## chisq = 0.35254, df = 3, p-value = 0.9499  
## alternative hypothesis: one model is inconsistent

# Modele estime par la methode des MCO versus modele a effets aleatoires  
plmtest(MCO4, effect="twoways", type="bp")

##   
## Lagrange Multiplier Test - two-ways effects (Breusch-Pagan) for  
## balanced panels  
##   
## data: form4  
## chisq = 1.374, df = 2, p-value = 0.5031  
## alternative hypothesis: significant effects

# Modele estime par la methode desMCO versus modele a effets fixes  
pFtest(FE4, MCO4)

##   
## F test for individual effects  
##   
## data: form4  
## F = 3.9042, df1 = 2, df2 = 24, p-value = 0.03404  
## alternative hypothesis: significant effects

# Ajustement du modele choisi  
  
# Test d'heteroscedasticite  
library(lmtest)  
bptest(form4, data = data, studentize = F)

##   
## Breusch-Pagan test  
##   
## data: form4  
## BP = 38.911, df = 3, p-value = 1.812e-08

# Breusch-Godfrey/Wooldridge test for serial correlation  
pbgtest(random4)

##   
## Breusch-Godfrey/Wooldridge test for serial correlation in panel models  
##   
## data: form4  
## chisq = 13.309, df = 10, p-value = 0.2069  
## alternative hypothesis: serial correlation in idiosyncratic errors

# Test de multicolinearite  
library(performance)  
check\_collinearity(MCO3)

## # Check for Multicollinearity  
##   
## Low Correlation  
##   
## Parameter VIF Increased SE  
## RSE 1.11 1.06  
## TAILLE 1.12 1.06  
## RISQUE 1.01 1.00

# Resultats du modele ajuste  
  
coeftest(MCO4, vcov.=function(x) vcovHC(x, method="arellano",  
 type="HC0", cluster="group"))

##   
## t test of coefficients:  
##   
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 2.3681e-01 6.2098e-03 38.1354 < 2.2e-16 \*\*\*  
## RSE 4.5152e-02 7.2851e-02 0.6198 0.5408   
## TAILLE -1.7463e-05 3.1657e-06 -5.5165 8.645e-06 \*\*\*  
## RISQUE 6.0703e-04 8.1414e-04 0.7456 0.4626   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

#...........................Model 5.............  
  
form5<-MARGE\_OPERA ~ RSE+TAILLE+RISQUE  
# Modele de regression estime par la methode des MCO   
MCO5 <- plm(form5,data = data,   
 model = "pooling",effect = "twoways")  
summary(MCO5)

## Pooling Model  
##   
## Call:  
## plm(formula = form5, data = data, effect = "twoways", model = "pooling")  
##   
## Balanced Panel: n = 3, T = 10, N = 30  
##   
## Residuals:  
## Min. 1st Qu. Median 3rd Qu. Max.   
## -0.121291 -0.075452 -0.040680 0.008303 1.188361   
##   
## Coefficients:  
## Estimate Std. Error t-value Pr(>|t|)  
## (Intercept) 1.3616e-01 9.8158e-02 1.3871 0.1772  
## RSE -8.9613e-02 9.5447e-02 -0.9389 0.3564  
## TAILLE 2.0583e-05 2.7497e-05 0.7485 0.4609  
## RISQUE -1.8534e-04 1.1351e-03 -0.1633 0.8716  
##   
## Total Sum of Squares: 1.6102  
## Residual Sum of Squares: 1.5428  
## R-Squared: 0.041892  
## Adj. R-Squared: -0.068659  
## F-statistic: 0.378935 on 3 and 26 DF, p-value: 0.76896

# Modele a effets fixes   
FE5 <- plm(form5,data = data,   
 model = "within")  
summary(FE5)

## Oneway (individual) effect Within Model  
##   
## Call:  
## plm(formula = form5, data = data, model = "within")  
##   
## Balanced Panel: n = 3, T = 10, N = 30  
##   
## Residuals:  
## Min. 1st Qu. Median 3rd Qu. Max.   
## -0.172522 -0.105636 -0.023593 0.020919 1.120145   
##   
## Coefficients:  
## Estimate Std. Error t-value Pr(>|t|)  
## RSE 1.7678e-02 1.2312e-01 0.1436 0.8870  
## TAILLE 1.1812e-05 7.5084e-05 0.1573 0.8763  
## RISQUE 7.4186e-04 1.7573e-03 0.4221 0.6767  
##   
## Total Sum of Squares: 1.4357  
## Residual Sum of Squares: 1.4243  
## R-Squared: 0.0078997  
## Adj. R-Squared: -0.19879  
## F-statistic: 0.0637005 on 3 and 24 DF, p-value: 0.97851

# Modele a effets aleatoires   
random5 <- plm(form5, data = data,   
 random.method="swar",effect = "twoways")  
summary(random5)

## Twoways effects Within Model  
##   
## Call:  
## plm(formula = form5, data = data, effect = "twoways", random.method = "swar")  
##   
## Balanced Panel: n = 3, T = 10, N = 30  
##   
## Residuals:  
## Min. 1st Qu. Median 3rd Qu. Max.   
## -0.3873868 -0.0418267 -0.0014245 0.0616365 0.5416408   
##   
## Coefficients:  
## Estimate Std. Error t-value Pr(>|t|)   
## RSE 2.9294e-01 1.7315e-01 1.6918 0.11134   
## TAILLE 1.5152e-04 8.3944e-05 1.8050 0.09119 .  
## RISQUE 1.8227e-03 2.2341e-03 0.8159 0.42735   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Total Sum of Squares: 0.99193  
## Residual Sum of Squares: 0.6906  
## R-Squared: 0.30378  
## Adj. R-Squared: -0.34602  
## F-statistic: 2.18164 on 3 and 15 DF, p-value: 0.13266

# Modele a effets fixes VS modele a effets aleatoires Haussman   
phtest(FE5,random5, vcov = "vcovHC")

##   
## Hausman Test  
##   
## data: form5  
## chisq = 27.142, df = 3, p-value = 5.498e-06  
## alternative hypothesis: one model is inconsistent

# Modele estime par la methode des MCO versus modele a effets aleatoires  
plmtest(MCO5, effect="twoways", type="bp")

##   
## Lagrange Multiplier Test - two-ways effects (Breusch-Pagan) for  
## balanced panels  
##   
## data: form5  
## chisq = 0.74048, df = 2, p-value = 0.6906  
## alternative hypothesis: significant effects

# Modele estime par la methode desMCO versus modele a effets fixes  
pFtest(FE5, MCO5)

##   
## F test for individual effects  
##   
## data: form5  
## F = 0.99803, df1 = 2, df2 = 24, p-value = 0.3834  
## alternative hypothesis: significant effects

# Ajustement du modele choisi  
  
# Test d'heteroscedasticite  
library(lmtest)  
bptest(form5, data = data, studentize = F)

##   
## Breusch-Pagan test  
##   
## data: form5  
## BP = 13.114, df = 3, p-value = 0.004396

# Test d'autocorrelation  
pdwtest(random5, alternative="two.sided")

##   
## Durbin-Watson test for serial correlation in panel models  
##   
## data: form5  
## DW = 2.0373, p-value = 0.9491  
## alternative hypothesis: serial correlation in idiosyncratic errors

# Breusch-Godfrey/Wooldridge test for serial correlation  
pbgtest(random5)

##   
## Breusch-Godfrey/Wooldridge test for serial correlation in panel models  
##   
## data: form5  
## chisq = 12.281, df = 10, p-value = 0.2667  
## alternative hypothesis: serial correlation in idiosyncratic errors

# Test de multicolinearite  
library(performance)  
check\_collinearity(MCO3)

## # Check for Multicollinearity  
##   
## Low Correlation  
##   
## Parameter VIF Increased SE  
## RSE 1.11 1.06  
## TAILLE 1.12 1.06  
## RISQUE 1.01 1.00

# Resultats du modele ajuste  
  
coeftest(MCO5, vcov.=function(x) vcovHC(x, method="arellano",  
 type="HC0", cluster="group"))

##   
## t test of coefficients:  
##   
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 1.3616e-01 6.8159e-02 1.9977 0.05632 .  
## RSE -8.9613e-02 3.4155e-02 -2.6237 0.01436 \*  
## TAILLE 2.0583e-05 1.4524e-05 1.4172 0.16830   
## RISQUE -1.8534e-04 4.5404e-04 -0.4082 0.68647   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

#...........................Model 6.............  
  
form6<-MARGE\_IBITDA ~ RSE+TAILLE+RISQUE  
# Modele de regression estime par la methode des MCO   
MCO6 <- plm(form6,data = data,   
 model = "pooling",effect = "twoways")  
summary(MCO6)

## Pooling Model  
##   
## Call:  
## plm(formula = form6, data = data, effect = "twoways", model = "pooling")  
##   
## Balanced Panel: n = 3, T = 10, N = 30  
##   
## Residuals:  
## Min. 1st Qu. Median 3rd Qu. Max.   
## -11.48512 -3.37067 -0.53781 4.63913 10.30356   
##   
## Coefficients:  
## Estimate Std. Error t-value Pr(>|t|)   
## (Intercept) 0.89735090 2.34381729 0.3829 0.7049   
## RSE -0.87015570 2.27908079 -0.3818 0.7057   
## TAILLE 0.00576377 0.00065658 8.7785 2.97e-09 \*\*\*  
## RISQUE 0.03958239 0.02710332 1.4604 0.1562   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Total Sum of Squares: 3855.6  
## Residual Sum of Squares: 879.63  
## R-Squared: 0.77185  
## Adj. R-Squared: 0.74553  
## F-statistic: 29.3207 on 3 and 26 DF, p-value: 1.6854e-08

# Modele a effets fixes   
FE6 <- plm(form6,data = data,   
 model = "within")  
summary(FE6)

## Oneway (individual) effect Within Model  
##   
## Call:  
## plm(formula = form6, data = data, model = "within")  
##   
## Balanced Panel: n = 3, T = 10, N = 30  
##   
## Residuals:  
## Min. 1st Qu. Median 3rd Qu. Max.   
## -14.86691 -1.77639 0.19205 2.12739 8.67646   
##   
## Coefficients:  
## Estimate Std. Error t-value Pr(>|t|)   
## RSE 5.1860990 2.2964074 2.2584 0.03329 \*  
## TAILLE 0.0027823 0.0014005 1.9867 0.05849 .  
## RISQUE 0.0440119 0.0327779 1.3427 0.19192   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Total Sum of Squares: 762.12  
## Residual Sum of Squares: 495.52  
## R-Squared: 0.34982  
## Adj. R-Squared: 0.21437  
## F-statistic: 4.30432 on 3 and 24 DF, p-value: 0.014518

# Modele a effets aleatoires   
random6 <- plm(form6, data = data,   
 random.method="swar",effect = "twoways")  
summary(random6)

## Twoways effects Within Model  
##   
## Call:  
## plm(formula = form6, data = data, effect = "twoways", random.method = "swar")  
##   
## Balanced Panel: n = 3, T = 10, N = 30  
##   
## Residuals:  
## Min. 1st Qu. Median 3rd Qu. Max.   
## -8.596199 -1.623516 -0.094433 1.413967 7.781884   
##   
## Coefficients:  
## Estimate Std. Error t-value Pr(>|t|)  
## RSE 3.96277130 3.34349755 1.1852 0.2544  
## TAILLE 0.00094977 0.00162097 0.5859 0.5666  
## RISQUE -0.02079595 0.04314040 -0.4821 0.6367  
##   
## Total Sum of Squares: 317.44  
## Residual Sum of Squares: 257.51  
## R-Squared: 0.18879  
## Adj. R-Squared: -0.56833  
## F-statistic: 1.16366 on 3 and 15 DF, p-value: 0.3563

# Modele a effets fixes VS modele a effets aleatoires Haussman   
phtest(FE6,random6, vcov = "vcovHC")

##   
## Hausman Test  
##   
## data: form6  
## chisq = 6.1611, df = 3, p-value = 0.104  
## alternative hypothesis: one model is inconsistent

# Modele estime par la methode des MCO versus modele a effets aleatoires  
plmtest(MCO6, effect="twoways", type="bp")

##   
## Lagrange Multiplier Test - two-ways effects (Breusch-Pagan) for  
## balanced panels  
##   
## data: form6  
## chisq = 1.8262, df = 2, p-value = 0.4013  
## alternative hypothesis: significant effects

# Modele estime par la methode desMCO versus modele a effets fixes  
pFtest(FE6, MCO6)

##   
## F test for individual effects  
##   
## data: form6  
## F = 9.3022, df1 = 2, df2 = 24, p-value = 0.001021  
## alternative hypothesis: significant effects

# Ajustement du modele choisi  
  
# Test d'heteroscedasticite  
library(lmtest)  
bptest(form6, data = data, studentize = F)

##   
## Breusch-Pagan test  
##   
## data: form6  
## BP = 6.9464, df = 3, p-value = 0.07363

# Test d'autocorrelation  
pdwtest(FE6, alternative="two.sided")

##   
## Durbin-Watson test for serial correlation in panel models  
##   
## data: form6  
## DW = 1.896, p-value = 0.6526  
## alternative hypothesis: serial correlation in idiosyncratic errors

# Breusch-Godfrey/Wooldridge test for serial correlation  
pbgtest(FE6)

##   
## Breusch-Godfrey/Wooldridge test for serial correlation in panel models  
##   
## data: form6  
## chisq = 10.125, df = 10, p-value = 0.4296  
## alternative hypothesis: serial correlation in idiosyncratic errors

# Test de multicolinearite  
library(performance)  
check\_collinearity(MCO3)

## # Check for Multicollinearity  
##   
## Low Correlation  
##   
## Parameter VIF Increased SE  
## RSE 1.11 1.06  
## TAILLE 1.12 1.06  
## RISQUE 1.01 1.00

# Resultats du modele ajuste  
  
coeftest(FE6, vcov.=function(x) vcovHC(x, method="arellano",  
 type="HC0", cluster="group"))

##   
## t test of coefficients:  
##   
## Estimate Std. Error t value Pr(>|t|)   
## RSE 5.18609896 0.23277412 22.2795 < 2.2e-16 \*\*\*  
## TAILLE 0.00278233 0.00027373 10.1647 3.57e-10 \*\*\*  
## RISQUE 0.04401189 0.01357086 3.2431 0.003459 \*\*   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

#...........................Model 7.............  
  
form7<-EBE ~ RSE+TAILLE+RISQUE  
# Modele de regression estime par la methode des MCO   
MCO7 <- plm(form7,data = data,   
 model = "pooling",effect = "twoways")  
summary(MCO7)

## Pooling Model  
##   
## Call:  
## plm(formula = form7, data = data, effect = "twoways", model = "pooling")  
##   
## Balanced Panel: n = 3, T = 10, N = 30  
##   
## Residuals:  
## Min. 1st Qu. Median 3rd Qu. Max.   
## -265.951 -137.384 -87.180 86.708 490.374   
##   
## Coefficients:  
## Estimate Std. Error t-value Pr(>|t|)   
## (Intercept) 515.621893 90.610764 5.6905 5.490e-06 \*\*\*  
## RSE 171.234403 88.108084 1.9435 0.06286 .   
## TAILLE 0.136283 0.025383 5.3690 1.272e-05 \*\*\*  
## RISQUE 0.625615 1.047800 0.5971 0.55562   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Total Sum of Squares: 3559800  
## Residual Sum of Squares: 1314700  
## R-Squared: 0.63069  
## Adj. R-Squared: 0.58808  
## F-statistic: 14.8006 on 3 and 26 DF, p-value: 8.0619e-06

# Modele a effets fixes   
FE7 <- plm(form7,data = data,   
 model = "within")  
summary(FE7)

## Oneway (individual) effect Within Model  
##   
## Call:  
## plm(formula = form7, data = data, model = "within")  
##   
## Balanced Panel: n = 3, T = 10, N = 30  
##   
## Residuals:  
## Min. 1st Qu. Median 3rd Qu. Max.   
## -248.735 -153.632 -61.529 97.130 447.276   
##   
## Coefficients:  
## Estimate Std. Error t-value Pr(>|t|)   
## RSE 86.13134 114.97827 0.7491 0.46107   
## TAILLE 0.16945 0.07012 2.4166 0.02363 \*  
## RISQUE 0.39524 1.64115 0.2408 0.81173   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Total Sum of Squares: 1860300  
## Residual Sum of Squares: 1242200  
## R-Squared: 0.33224  
## Adj. R-Squared: 0.19313  
## F-statistic: 3.9804 on 3 and 24 DF, p-value: 0.019582

# Modele a effets aleatoires   
random7 <- plm(form7, data = data,   
 random.method="swar", effect = "twoways")  
summary(random7)

## Twoways effects Within Model  
##   
## Call:  
## plm(formula = form7, data = data, effect = "twoways", random.method = "swar")  
##   
## Balanced Panel: n = 3, T = 10, N = 30  
##   
## Residuals:  
## Min. 1st Qu. Median 3rd Qu. Max.   
## -259.557 -129.970 -13.949 44.683 395.478   
##   
## Coefficients:  
## Estimate Std. Error t-value Pr(>|t|)  
## RSE -89.423425 203.360997 -0.4397 0.6664  
## TAILLE 0.160662 0.098592 1.6296 0.1240  
## RISQUE 0.184154 2.623921 0.0702 0.9450  
##   
## Total Sum of Squares: 1212700  
## Residual Sum of Squares: 952640  
## R-Squared: 0.21448  
## Adj. R-Squared: -0.51868  
## F-statistic: 1.36519 on 3 and 15 DF, p-value: 0.2914

# Modele a effets fixes VS modele a effets aleatoires Haussman   
phtest(FE7,random7, vcov = "vcovHC")

##   
## Hausman Test  
##   
## data: form7  
## chisq = 1.1063, df = 3, p-value = 0.7756  
## alternative hypothesis: one model is inconsistent

# Modele estime par la methode des MCO versus modele a effets aleatoires  
plmtest(MCO7, effect="twoways", type="bp")

##   
## Lagrange Multiplier Test - two-ways effects (Breusch-Pagan) for  
## balanced panels  
##   
## data: form7  
## chisq = 2.8128, df = 2, p-value = 0.245  
## alternative hypothesis: significant effects

# Modele estime par la methode desMCO versus modele a effets fixes  
pFtest(FE7, MCO7)

##   
## F test for individual effects  
##   
## data: form7  
## F = 0.7, df1 = 2, df2 = 24, p-value = 0.5064  
## alternative hypothesis: significant effects

# Ajustement du modele choisi  
  
# Test d'heteroscedasticite  
library(lmtest)  
bptest(form7, data = data, studentize = F)

##   
## Breusch-Pagan test  
##   
## data: form7  
## BP = 3.9986, df = 3, p-value = 0.2616

# Test d'autocorrelation  
pdwtest(random7, alternative="two.sided")

##   
## Durbin-Watson test for serial correlation in panel models  
##   
## data: form7  
## DW = 1.2825, p-value = 0.02697  
## alternative hypothesis: serial correlation in idiosyncratic errors

# Breusch-Godfrey/Wooldridge test for serial correlation  
pbgtest(MCO7)

##   
## Breusch-Godfrey/Wooldridge test for serial correlation in panel models  
##   
## data: form7  
## chisq = 12.782, df = 10, p-value = 0.2361  
## alternative hypothesis: serial correlation in idiosyncratic errors

# Test de multicolinearite  
library(performance)  
check\_collinearity(MCO3)

## # Check for Multicollinearity  
##   
## Low Correlation  
##   
## Parameter VIF Increased SE  
## RSE 1.11 1.06  
## TAILLE 1.12 1.06  
## RISQUE 1.01 1.00

# Resultats du modele ajuste  
  
coeftest(FE7, vcov.=function(x) vcovHC(x, method="arellano",  
 type="HC0", cluster="group"))

##   
## t test of coefficients:  
##   
## Estimate Std. Error t value Pr(>|t|)   
## RSE 86.131343 147.195267 0.5852 0.56391   
## TAILLE 0.169453 0.073929 2.2921 0.03097 \*  
## RISQUE 0.395241 0.564137 0.7006 0.49028   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

#...........................Model 8.............  
  
form8<-MBN ~ RSE+TAILLE+RISQUE  
  
# Modele de regression estime par la methode des MCO   
MCO8 <- plm(form8,data = data,   
 model = "pooling",effect = "twoways")  
summary(MCO8)

## Pooling Model  
##   
## Call:  
## plm(formula = form8, data = data, effect = "twoways", model = "pooling")  
##   
## Balanced Panel: n = 3, T = 10, N = 30  
##   
## Residuals:  
## Min. 1st Qu. Median 3rd Qu. Max.   
## -0.0863272 -0.0269890 -0.0031012 0.0306931 0.0694875   
##   
## Coefficients:  
## Estimate Std. Error t-value Pr(>|t|)   
## (Intercept) 1.4495e-02 1.5825e-02 0.9159 0.3681216   
## RSE 2.0735e-02 1.5388e-02 1.3475 0.1894480   
## TAILLE 1.9451e-05 4.4332e-06 4.3877 0.0001691 \*\*\*  
## RISQUE 1.4053e-04 1.8300e-04 0.7679 0.4494524   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Total Sum of Squares: 0.084454  
## Residual Sum of Squares: 0.040101  
## R-Squared: 0.52518  
## Adj. R-Squared: 0.47039  
## F-statistic: 9.58585 on 3 and 26 DF, p-value: 0.00019503

# Modele a effets fixes   
FE8 <- plm(form8,data = data,   
 model = "within")  
summary(FE8)

## Oneway (individual) effect Within Model  
##   
## Call:  
## plm(formula = form8, data = data, model = "within")  
##   
## Balanced Panel: n = 3, T = 10, N = 30  
##   
## Residuals:  
## Min. 1st Qu. Median 3rd Qu. Max.   
## -0.0530959 -0.0103817 0.0072196 0.0147177 0.0573722   
##   
## Coefficients:  
## Estimate Std. Error t-value Pr(>|t|)   
## RSE 6.6968e-02 1.4257e-02 4.6972 8.969e-05 \*\*\*  
## TAILLE 5.6615e-06 8.6948e-06 0.6511 0.5211   
## RISQUE 3.4718e-04 2.0350e-04 1.7061 0.1009   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Total Sum of Squares: 0.039732  
## Residual Sum of Squares: 0.0191  
## R-Squared: 0.51929  
## Adj. R-Squared: 0.41914  
## F-statistic: 8.64196 on 3 and 24 DF, p-value: 0.00045743

# Modele a effets aleatoires   
random8 <- plm(form8, data = data,   
 random.method="swar",effect = "twoways")  
summary(random8)

## Twoways effects Within Model  
##   
## Call:  
## plm(formula = form8, data = data, effect = "twoways", random.method = "swar")  
##   
## Balanced Panel: n = 3, T = 10, N = 30  
##   
## Residuals:  
## Min. 1st Qu. Median 3rd Qu. Max.   
## -0.0279923 -0.0121391 -0.0032395 0.0136333 0.0331395   
##   
## Coefficients:  
## Estimate Std. Error t-value Pr(>|t|)   
## RSE 4.5890e-02 1.9094e-02 2.4033 0.02963 \*  
## TAILLE -1.1366e-06 9.2572e-06 -0.1228 0.90391   
## RISQUE 8.1302e-05 2.4637e-04 0.3300 0.74596   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Total Sum of Squares: 0.011647  
## Residual Sum of Squares: 0.0083985  
## R-Squared: 0.27892  
## Adj. R-Squared: -0.39408  
## F-statistic: 1.93406 on 3 and 15 DF, p-value: 0.16747

# Modele a effets fixes VS modele a effets aleatoires Haussman   
phtest(FE8,random8, vcov = "vcovHC")

##   
## Hausman Test  
##   
## data: form8  
## chisq = 4.546, df = 3, p-value = 0.2082  
## alternative hypothesis: one model is inconsistent

# Modele estime par la methode des MCO versus modele a effets aleatoires  
plmtest(MCO8, effect="twoways", type="bp")

##   
## Lagrange Multiplier Test - two-ways effects (Breusch-Pagan) for  
## balanced panels  
##   
## data: form8  
## chisq = 4.9663, df = 2, p-value = 0.08348  
## alternative hypothesis: significant effects

# Modele estime par la methode des MCO versus modele a effets fixes  
pFtest(FE8, MCO8)

##   
## F test for individual effects  
##   
## data: form8  
## F = 13.194, df1 = 2, df2 = 24, p-value = 0.0001363  
## alternative hypothesis: significant effects

# Ajustement du modele choisi  
  
# Test d'heteroscedasticite  
library(lmtest)  
bptest(form8, data = data, studentize = F)

##   
## Breusch-Pagan test  
##   
## data: form8  
## BP = 8.3665, df = 3, p-value = 0.03901

# Test d'autocorrelation  
pdwtest(random8, alternative="two.sided")

##   
## Durbin-Watson test for serial correlation in panel models  
##   
## data: form8  
## DW = 1.7805, p-value = 0.4383  
## alternative hypothesis: serial correlation in idiosyncratic errors

# Breusch-Godfrey/Wooldridge test for serial correlation  
pbgtest(random8)

##   
## Breusch-Godfrey/Wooldridge test for serial correlation in panel models  
##   
## data: form8  
## chisq = 17.092, df = 10, p-value = 0.07235  
## alternative hypothesis: serial correlation in idiosyncratic errors

# Test de multicolinearite  
library(performance)  
check\_collinearity(MCO8)

## # Check for Multicollinearity  
##   
## Low Correlation  
##   
## Parameter VIF Increased SE  
## RSE 1.11 1.06  
## TAILLE 1.12 1.06  
## RISQUE 1.01 1.00

# Resultats du modele ajuste  
  
coeftest(random8, vcov.=function(x) vcovHC(x, method="arellano",  
 type="HC0", cluster="group"))

##   
## t test of coefficients:  
##   
## Estimate Std. Error t value Pr(>|t|)   
## RSE 4.5890e-02 1.6239e-02 2.8258 0.01278 \*  
## TAILLE -1.1366e-06 1.3853e-06 -0.8204 0.42481   
## RISQUE 8.1302e-05 9.7525e-05 0.8337 0.41755   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1