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# Exo 1
## 1. Generer X
n=100
X=runif(n,2,10)
## 2. Generer e
e=rnorm(n,0,2)
## 3. Definir Y et Z
Y=2*X+5+e
Z=X*X+5+e
## 4. Estimation
modell=lm(Y~X)
model2=lm(Z~X)

plot(X,Z)
abline(model2, col = "red")
lines(sort(X), sort(X)*sort(X)+5, col="blue")

x=seq(2,10,0.01)
lines(x, x*x+5, col="blue")

plot(X,Y)
lines(X, 2*X+5)

plot(X,Z)
lines(sort(X), sort(X)*sort(X)+5)

plot(sort(X), sort(X)*sort(X)+5, type="l")

summary(modell)
summary(model2)
## 5. Graphique
par(mfrow=c(1,2))
plot(X,Y)
abline(modell,col="red")
lines(sort(X),2*sort(X)+5,col="blue")
plot(X,Z)
abline(model2,col="red")
lines(sort(X),sort(X)*sort(X)+5,col="blue")
## 6. Residus
par(mfrow=c(2,2))
plot(modell,which=1)
plot(modell,which=2)
plot(modell,which=3)
plot(modell,which=4)

par(mfrow=c(2,2))
plot(modell,which=1)
plot(modell,which=2)
plot(model2,which=1)
plot(model2,which=2)

par(mfrow=c(2,2))
plot(model2,which=1)
plot(model2,which=2)
plot(model2,which=3)
plot(model2,which=4)

sdr = sd(model2$residuals)
mr = mean(model2$residuals)
res2 = sqrt(abs((model2$residuals-mr)/sdr))

par(mfrow=c(1,2))
plot(model2,which=3)
plot(model2$fitted.values,res2)
## 7. Donnees en logarithme

model3=lm(log(Z)~log(X))
summary(model3)

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par(mfrow=c(1,2))
plot(X,Z)
abline(model2,col="red")
lines(sort(X),sort(X)*sort(X)+5,col="blue")
plot(log(X),log(Z))
abline(model3,col="red")
lines(sort(log(X)),log(sort(X)*sort(X)+5),col="blue")

X2=X*X
model4=lm(Z~X2)
summary(model4)

par(mfrow=c(2,2))
plot(model4,which=1)
plot(model4,which=2)
plot(model4,which=3)
plot(model4,which=4)

par(mfrow=c(2,2))
plot(model2,which=1)
plot(model2,which=2)
plot(model3,which=1)
plot(model3,which=2)
# Exo 2
### oeufs ###
oeufs = read.table("//dfs.univ-paris1.fr/nas/homes1/4/sliu/Documents/ecol/oeufs.txt", header
= T)

L = oeufs$LARGEUR
H = oeufs$HAUTEUR
P = oeufs$POIDS

reg1 = lm(P~L)
reg2 = lm(P~H)
reg3 = lm(log(P)~log(L))
reg4 = lm(log(P)~log(H))
fitP1 = fitted.values(reg1)
fitP2 = fitted.values(reg2)
fitP3 = exp(fitted.values(reg3))
fitP4 = exp(fitted.values(reg4))

sct = sum((P-mean(P))^2)
R1 = 1-sum((fitP1-P)^2)/sct
R2 = 1-sum((fitP2-P)^2)/sct
R3 = 1-sum((fitP3-P)^2)/sct
R4 = 1-sum((fitP4-P)^2)/sct

(c(R1,R2,R3,R4));(order((c(R1,R2,R3,R4))))

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