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# exemple pédagogique
# simulation de 100 observations
i=1:100;
Z1=i;Z2=i^2;Z3=i^3;Z4=i^4;Z5=sqrt(i);Z6=1/i;Z7=log(i);
epsilon=20*rnorm(100,0);
Y=5-0.03*Z2+0.0002*Z3-3*Z7+epsilon;
j=1:150;
YY=5-0.03*(j^2)+0.0002*(j^3)-3*log(j)
plot(j,YY,"l",xlim=c(-10,160),ylim=c(-150,50))
points(i,Y)

# la fonction estimée avec le modèle contenant toutes les variables
library(car)
y.lm7=lm(Y~Z1+Z2+Z3+Z4+Z5+Z6+Z7)
new=data.frame(Z1=j,Z2=j^2,Z3=j^3,Z4=j^4,Z5=sqrt(j),Z6=1/j,Z7=log(j))
y.pred7=predict(y.lm7,new)
points(j,y.pred7,"l",lty="dashed")

# Régression descendante
drop1(lm(Y~Z1+Z2+Z3+Z4+Z5+Z6+Z7),test="F")

y.lm.des=lm(Y~Z5+Z6+Z7)
y.pred.des=predict(y.lm.des,new)
points(j,y.pred.des,pch=20)

# mallows cp
library(leaps)
Z=matrix(c(Z1,Z2,Z3,Z4,Z5,Z6,Z7),ncol=7);
colnames(Z)=c("Z1","Z2","Z3","Z4","Z5","Z6","Z7");
r=leaps(Z,Y);
r$whi;
r$Cp;
t=(r$Cp==min(r$Cp));
colnames(Z)[r$whi[t]]

y.pred.cp=predict(lm(Y~Z2+Z4),new)
points(j,y.pred.cp,pch=19, col="blue")

# step AIC
step(y.lm7)

y.pred.aic=predict(lm(Y~Z2+Z3),new)
points(j,y.pred.aic,pch=20)

# step BIC
step(y.lm7, k=log(100))
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