

Regresion Multiple

2024-09-17

```
M = read.csv("Documents/AlCorte.csv")
head(M)
```

```
##   Fuerza Potencia Temperatura Tiempo Resistencia
## 1     30      60          175     15         26.2
## 2     40      60          175     15         26.3
## 3     30      90          175     15         39.8
## 4     40      90          175     15         39.7
## 5     30      60          225     15         38.6
## 6     40      60          225     15         35.5
```

```
modelo = lm(Resistencia ~ . , data = M )
pasos = step(modelo, direction="both", trace=1)
```

```
## Start:  AIC=102.96
## Resistencia ~ Fuerza + Potencia + Temperatura + Tiempo
##
##              Df Sum of Sq    RSS    AIC
## - Fuerza      1    26.88  692.00 102.15
## - Tiempo      1    40.04  705.16 102.72
## <none>                    665.12 102.96
## - Temperatura  1   252.20  917.32 110.61
## - Potencia     1  1341.01 2006.13 134.08
##
## Step:  AIC=102.15
## Resistencia ~ Potencia + Temperatura + Tiempo
##
##              Df Sum of Sq    RSS    AIC
## - Tiempo      1    40.04  732.04 101.84
## <none>                    692.00 102.15
## + Fuerza      1    26.88  665.12 102.96
## - Temperatura  1   252.20  944.20 109.47
## - Potencia     1  1341.02 2033.02 132.48
##
## Step:  AIC=101.84
## Resistencia ~ Potencia + Temperatura
##
##              Df Sum of Sq    RSS    AIC
## <none>                    732.04 101.84
## + Tiempo      1    40.04  692.00 102.15
## + Fuerza      1    26.88  705.16 102.72
## - Temperatura  1   252.20  984.24 108.72
## - Potencia     1  1341.01 2073.06 131.07
```

```
modelo_nulo = lm(Resistencia ~ 1, data = M)
pasos2 = step(modelo_nulo, scope = list(lower = modelo_nulo, upper =
```

```
modelo), direction = "forward")
```

```
## Start: AIC=132.51
## Resistencia ~ 1
##
##           Df Sum of Sq    RSS    AIC
## + Potencia    1   1341.01   984.24 108.72
## + Temperatura  1    252.20 2073.06 131.07
## <none>                2325.26 132.51
## + Tiempo      1     40.04 2285.22 133.99
## + Fuerza      1     26.88 2298.38 134.16
##
## Step: AIC=108.72
## Resistencia ~ Potencia
##
##           Df Sum of Sq    RSS    AIC
## + Temperatura  1   252.202 732.04 101.84
## <none>                984.24 108.72
## + Tiempo      1    40.042 944.20 109.47
## + Fuerza      1    26.882 957.36 109.89
##
## Step: AIC=101.84
## Resistencia ~ Potencia + Temperatura
##
##           Df Sum of Sq    RSS    AIC
## <none>                732.04 101.84
## + Tiempo    1    40.042 692.00 102.15
## + Fuerza    1    26.882 705.16 102.72
```

```
summary(pasos2)
```

```
##
## Call:
## lm(formula = Resistencia ~ Potencia + Temperatura, data = M)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -11.3233  -2.8067  -0.8483   3.1892   9.4600
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -24.90167    10.07207  -2.472  0.02001 *
## Potencia     0.49833     0.07086   7.033 1.47e-07 ***
## Temperatura  0.12967     0.04251   3.050 0.00508 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.207 on 27 degrees of freedom
## Multiple R-squared:  0.6852, Adjusted R-squared:  0.6619
## F-statistic: 29.38 on 2 and 27 DF,  p-value: 1.674e-07
```

```
n = length(M$Resistencia)
pasos3 = step(modelo, direction="both", k = log(n))
```

```
## Start: AIC=109.97
```

```

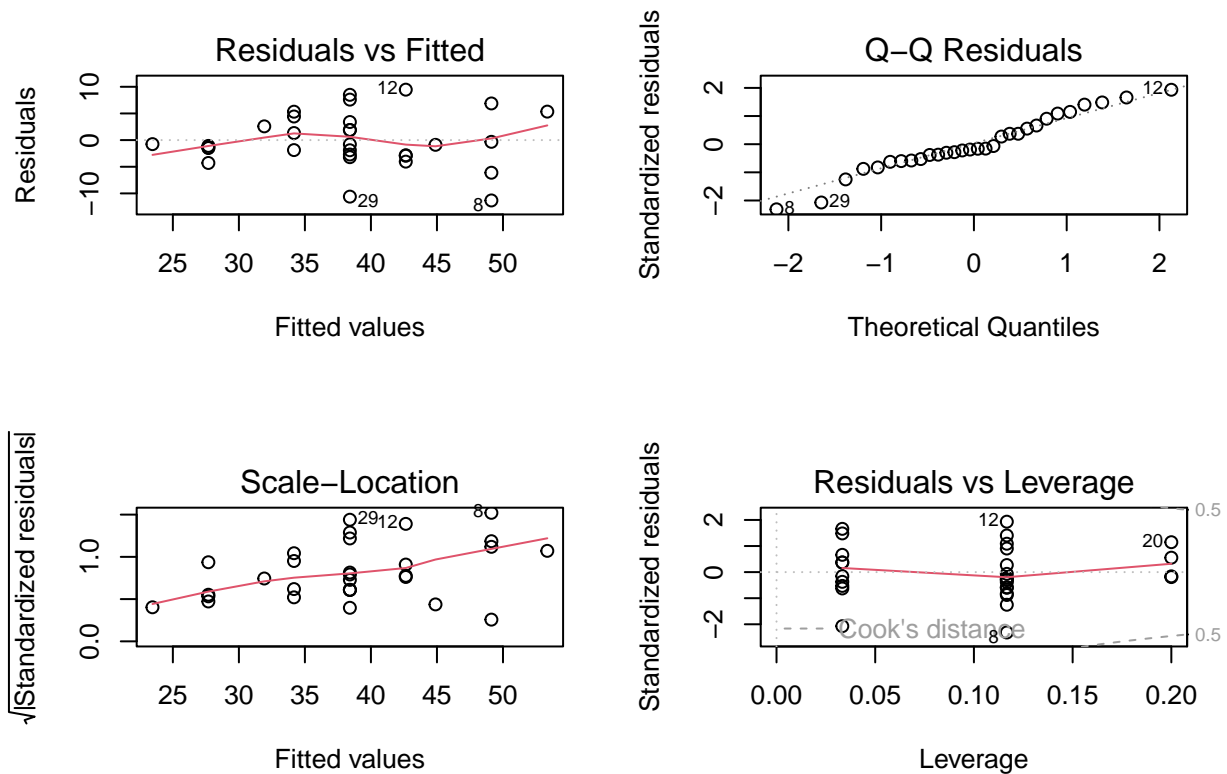
## Resistencia ~ Fuerza + Potencia + Temperatura + Tiempo
##
##           Df Sum of Sq      RSS      AIC
## - Fuerza    1     26.88   692.00  107.76
## - Tiempo    1     40.04   705.16  108.32
## <none>                        665.12  109.97
## - Temperatura 1     252.20   917.32  116.21
## - Potencia   1    1341.01  2006.13  139.69
##
## Step: AIC=107.76
## Resistencia ~ Potencia + Temperatura + Tiempo
##
##           Df Sum of Sq      RSS      AIC
## - Tiempo    1     40.04   732.04  106.04
## <none>                        692.00  107.76
## + Fuerza    1     26.88   665.12  109.97
## - Temperatura 1     252.20   944.20  113.68
## - Potencia   1    1341.02  2033.02  136.69
##
## Step: AIC=106.04
## Resistencia ~ Potencia + Temperatura
##
##           Df Sum of Sq      RSS      AIC
## <none>                        732.04  106.04
## + Tiempo    1     40.04   692.00  107.76
## + Fuerza    1     26.88   705.16  108.32
## - Temperatura 1     252.20   984.24  111.52
## - Potencia   1    1341.01  2073.06  133.87

summary(pasos3)

##
## Call:
## lm(formula = Resistencia ~ Potencia + Temperatura, data = M)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -11.3233  -2.8067  -0.8483   3.1892   9.4600
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -24.90167   10.07207  -2.472  0.02001 *
## Potencia     0.49833    0.07086   7.033 1.47e-07 ***
## Temperatura  0.12967    0.04251   3.050 0.00508 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.207 on 27 degrees of freedom
## Multiple R-squared:  0.6852, Adjusted R-squared:  0.6619
## F-statistic: 29.38 on 2 and 27 DF,  p-value: 1.674e-07

par(mfrow = c(2, 2))
plot(pasos3)

```



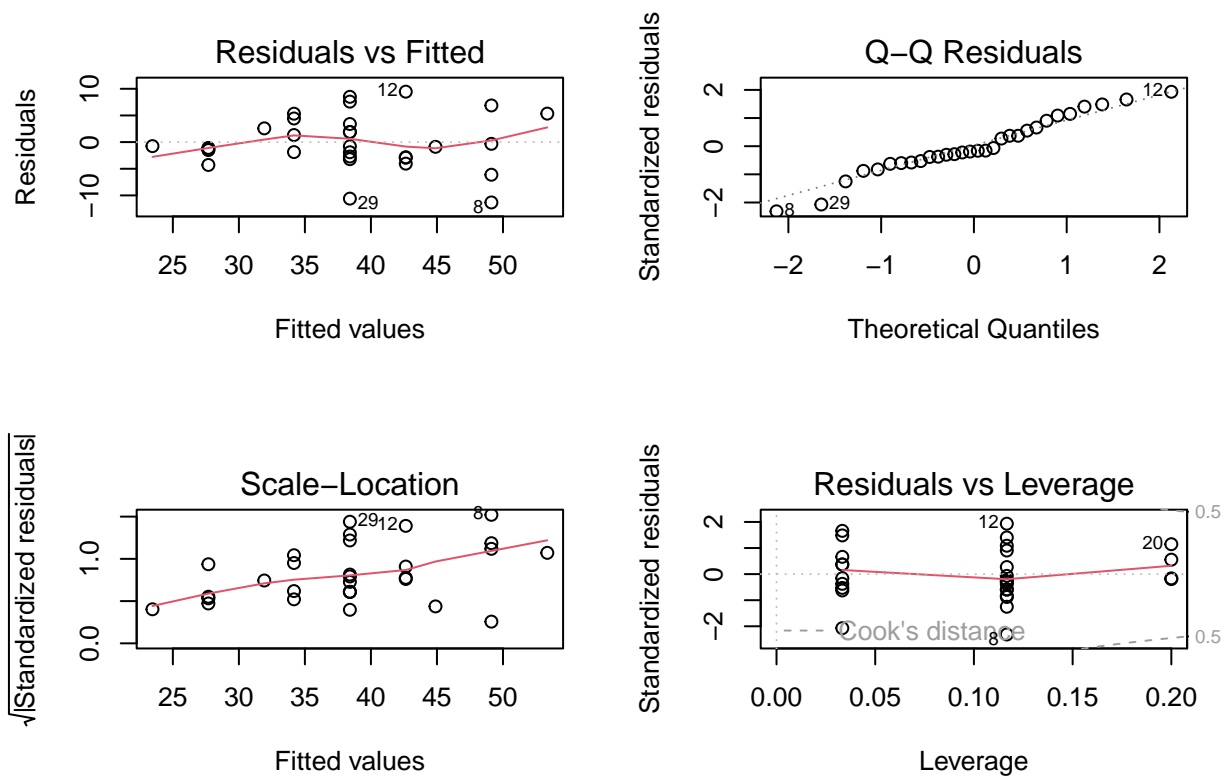
```
anova(pasos)
```

```
## Analysis of Variance Table
##
## Response: Resistencia
##          Df Sum Sq Mean Sq F value    Pr(>F)
## Potencia   1 1341.02  1341.02   49.461 1.465e-07 ***
## Temperatura 1  252.20   252.20    9.302 0.005082 **
## Residuals 27   732.04    27.11
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
par(mfrow = c(2, 2))
plot(pasos)
```

```
library(lmtest)
```

```
## Loading required package: zoo
##
## Attaching package: 'zoo'
## The following objects are masked from 'package:base':
##
##      as.Date, as.Date.numeric
```



```
bptest(pasos)
```

```
##
## studentized Breusch-Pagan test
##
## data: pasos
## BP = 4.0043, df = 2, p-value = 0.135
```

```
library(car)
```

```
## Loading required package: carData
```

```
vif_values <- vif(pasos)
print(vif_values)
```

```
##      Potencia Temperatura
##           1           1
```

```
summary(pasos)
```

```
##
## Call:
## lm(formula = Resistencia ~ Potencia + Temperatura, data = M)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -11.3233  -2.8067  -0.8483   3.1892   9.4600
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -24.90167   10.07207  -2.472  0.02001 *
## Potencia      0.49833    0.07086   7.033 1.47e-07 ***
```

```
## Temperatura    0.12967    0.04251    3.050  0.00508 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.207 on 27 degrees of freedom
## Multiple R-squared:  0.6852, Adjusted R-squared:  0.6619
## F-statistic: 29.38 on 2 and 27 DF,  p-value: 1.674e-07
```

Al final el primero modelo pasos es mejor que los otros, porque minimiza el riesgo de sobreajuste y ofrece una claridad en el proceso del modelado y tambien combina un ajuste solido.