Standardized Residuals

Definition

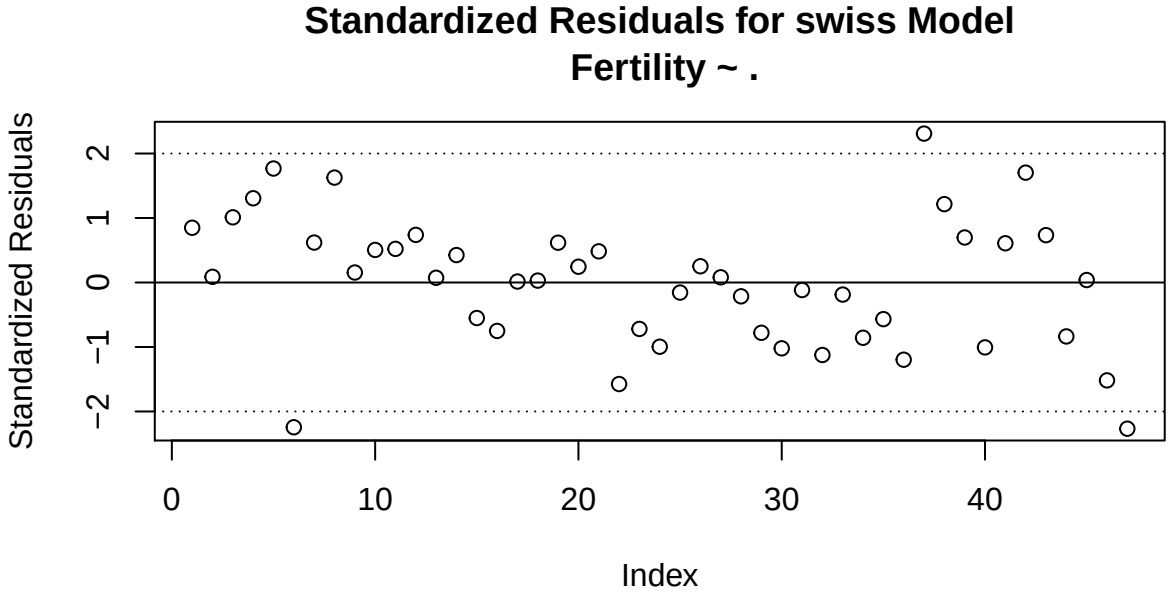
Standardized residuals are the fitted model residuals divided by the residual standard deviation where the residual standard deviation is the square root of the Mean Square Error of the model.

Equations

$$s_i = \frac{e_i}{\sqrt{MSE}} = \frac{e_i}{\hat{Var}(e_i)}$$

$$MSE = \frac{\sum(Y_i - \hat{Y}_i)^2}{n - p}$$

Example Plot



Interpretation and Use

Standardized residuals allow for comparing on the standard scale ($\sigma^2 = \sigma = 1$) where values exceeding +-2 on the scale may indicate an unusual occurence for further investigation.

Problems Since standardized residuals derive from $e_i = y_i - \hat{y}_i$, a y_i with high leverage will drag the regression towards it, influencing the residual estimate of y_i

Solutions and Further Avenues
Studentized Residuals - fit the regression with y_i excluded such that the residual becomes $y_i - \hat{y}_{i,(-i)}$ where $\hat{y}_{i,(-i)}$ denotes the regression line fit minus the point, y_i.

R Code

```
data(swiss)
model <- lm(Fertility ~ ., data=swiss)
stdResiduals <- rstandard(model)
#plot(stdResiduals, ylab="Standardized Residuals",
#        main="Standardized Residuals for swiss Model\n Fertility ~ .")
#abline(0,0)
#abline(h=2, lty = 3)
#abline(h=-2, lty = 3)
```