

EPSY 5261 : Introductory Statistical Methods

Day 27

Simple Linear Regression (Continued)

Learning Goals

- At the end of this lesson, you should be able to...
 - Conduct a test for a slope coefficient
 - Interpret results from a test for a slope coefficient

Test for a Slope

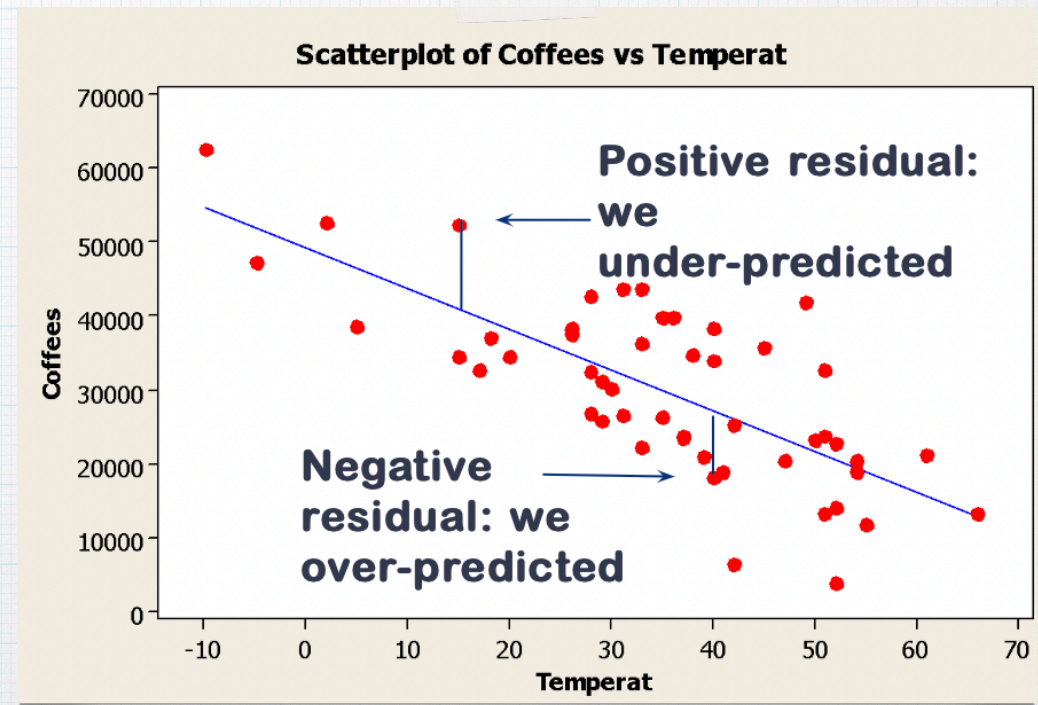
T-test for a slope

- $H_0 : \beta_1 = 0$
 - The slope equals 0 (there is no linear relationship between X and Y)
- $H_a : \beta_1 \neq 0$
 - The slope does not equal 0 (there is a linear relationship between X and Y)

Linear Regression: Model Fit

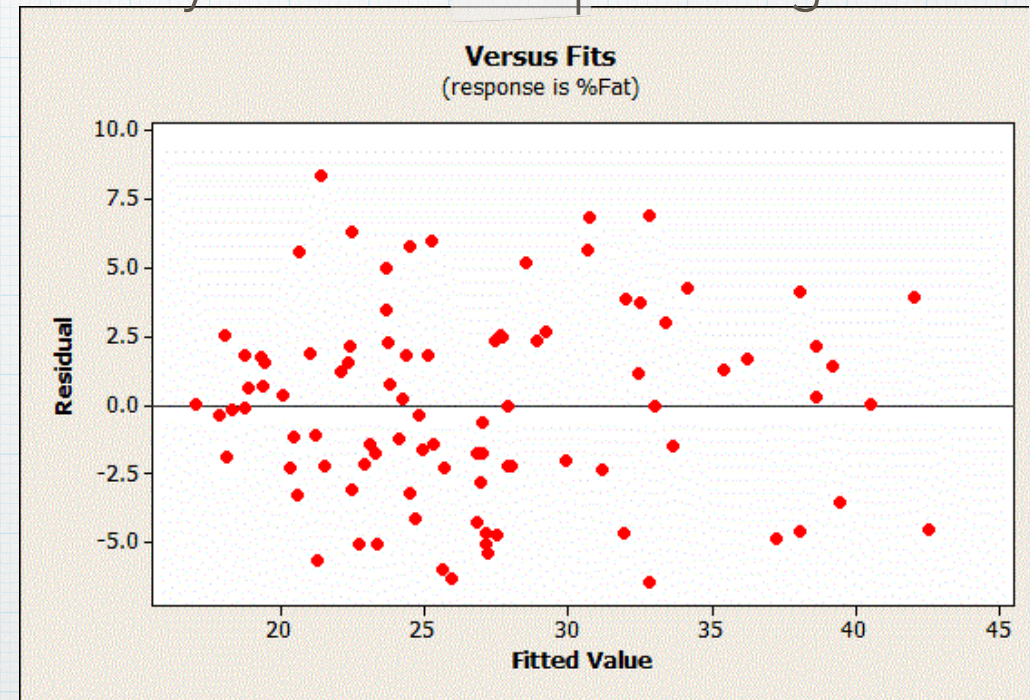
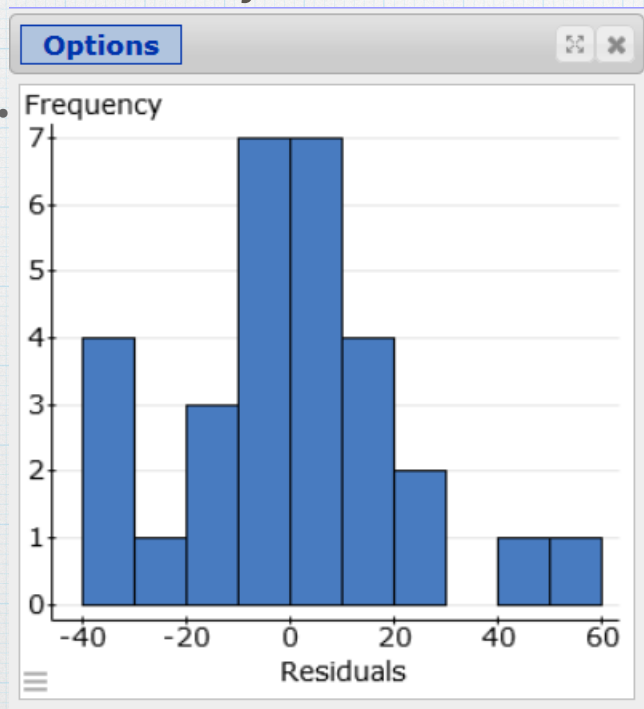
Recall: Residuals

- *Residual* = $y - \hat{y}$ (in that order)
- Difference between the observed and predicted values

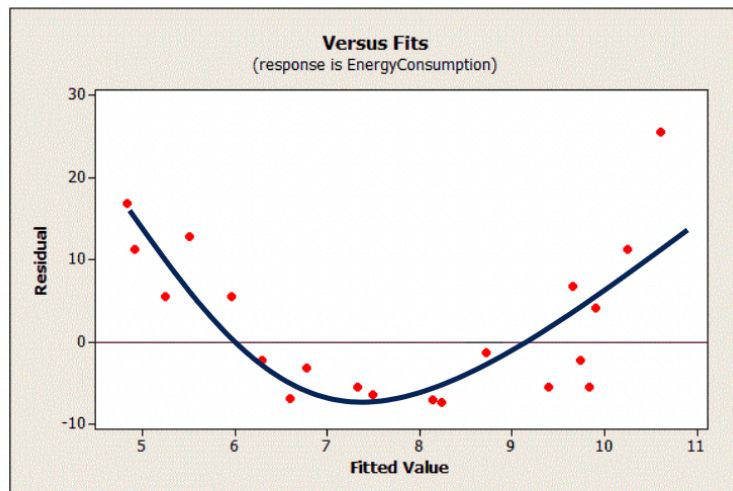


Residual Plots - what we want:

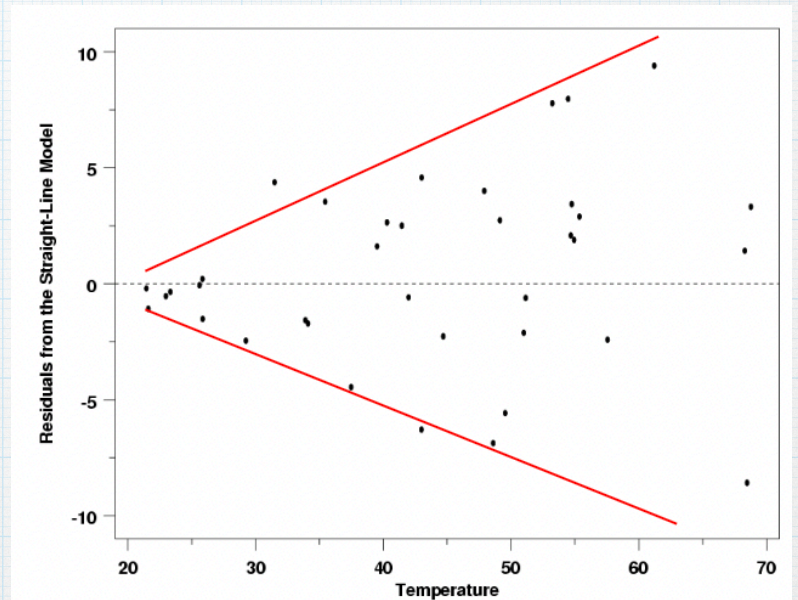
- Random pattern around the line residual = 0
- Means your model is not systematically over or under-predicting



Residual Plots - what we don't want:



Curved pattern: indicates possible quadratic pattern, violates assumption of linearity



Fanning out: Violates assumption of constant variance needed for regression

Assumptions for a Linear Model

- L - Pattern is linear (plot your data)
- I - Observations are independent from each other (i.e., one observation's Y value does not affect other observations' Y values)
- N - Residuals are normally distributed (histogram of residuals is approx. normal)
- E – “Equal variance”: Variability is constant (no fanning out of residuals on residual plot)

Testing for a Slope Activity

Summary

- If we want to determine if X is a significant predictor of Y we can do a test for the slope
- A small p -value tells us that there is evidence the slope is different than 0 (i.e. X is a predictor of Y)