Regression Analysis, Project Template, Residual Plots

Intuition: Residual Plots

(The attached PDF file has better formatting.)

Updated: February 13, 2006

Jacob: Can you show how to use residual plots to see if the slope parameter β is constant?

Rachel: Suppose we have 20 pairs of values for X and Y:

X	Y	X	Y	X	Y	X	Y
10	18	17	28	22	33	25	33
10	19	18	29	22	32	25	31
11	22	20	29	24	31	28	33
14	23	20	31	25	32	29	33
15	25	21	31	25	32	30	34

Ordinary least squares estimation gives

- $\hat{\alpha}$ = 13.671, with a standard error of 1.427 and a *t* statistic of 9.58
- $\hat{\beta}$ = 0.74351, with a standard error of 0.06666 and a *t* statistic of 11.15

Both coefficients have *p*-values of zero. The R^2 is 87.4% and the adjusted R^2 is 86.7%. The regression equation seems fine.

But the residual plots shows the relation is not linear. We use residual plots of the residual vs X and the residual vs the fitted value of Y. In both plots, the residuals look like a carot: /\.

Jacob: What does that indicate?

Rachel: The slope of the residual line is first positive and then negative. This means that the estimated β is too low for low values of X and too high for high values of X.