Chapter 7: Introduction to linear regression

OpenIntro Statistics, 3rd Edition
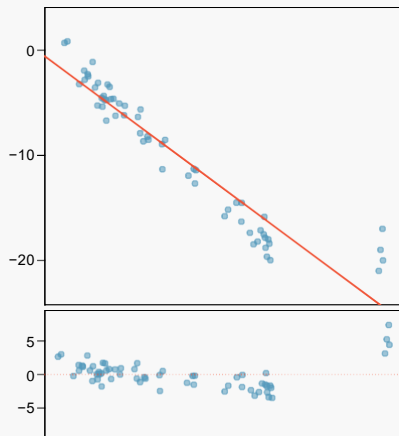
Slides developed by Mine Çetinkaya-Rundel of OpenIntro.

Types of outliers in linear regression

Types of outliers

How do outliers influence the
least squares line in this plot?

To answer this question think of
where the regression line would
be with and without the outlier(s).
Without the outliers the
regression line would be steeper,
and lie closer to the larger group
of observations. With the outliers
the line is pulled up and away
from some of the observations in
the larger group.

How do outliers influence the least squares line in this plot?

Without the outlier there is no evident relationship between x and y.
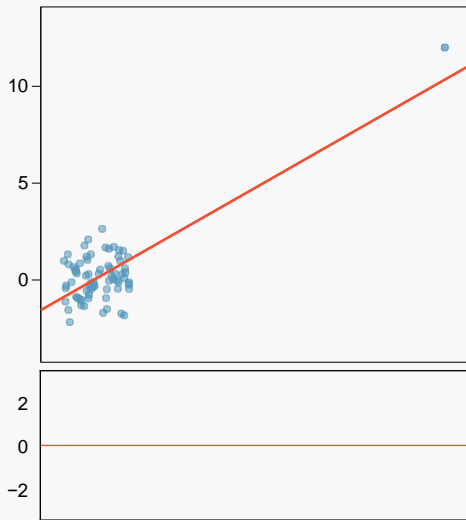
Some terminology

- *Outliers* are points that lie away from the cloud of points.
- Outliers that lie horizontally away from the center of the cloud are called *high leverage* points.
- High leverage points that actually influence the slope of the regression line are called *influential* points.
- In order to determine if a point is influential, visualize the regression line with and without the point. Does the slope of the line change considerably? If so, then the point is influential. If not, then its not an influential point.
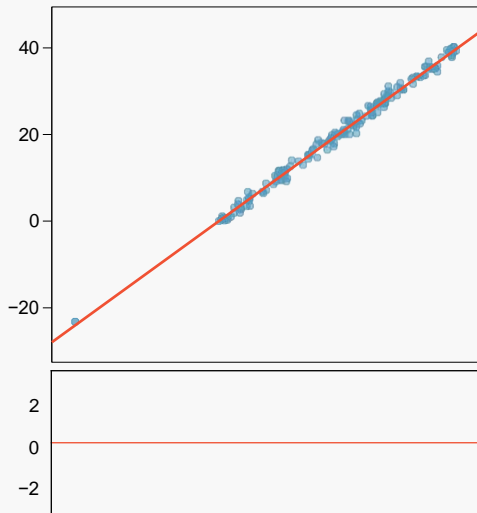
Influential points

Data are available on the log of the surface temperature and the log of the light intensity of 47 stars in the star cluster CYG OB1.
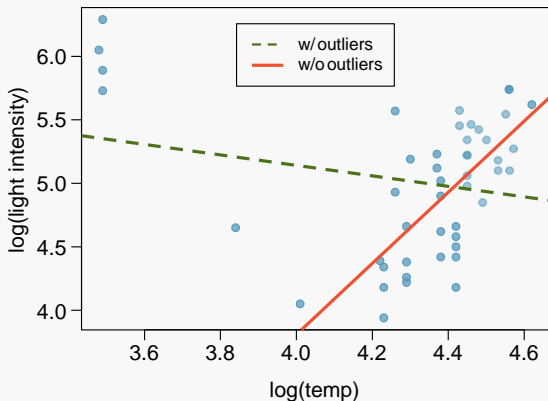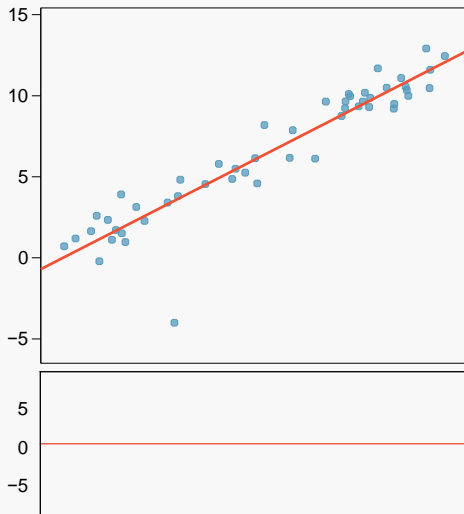
Which of the below best
describes the outlier?

(a) influential

(b) high leverage

(c) none of the above

(d) there are no outliers

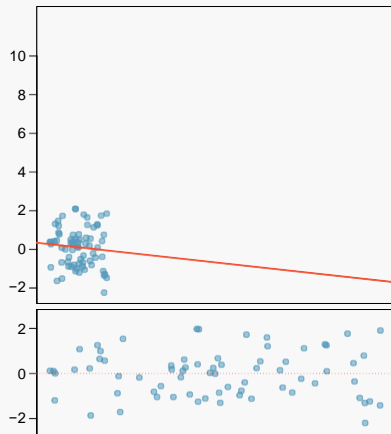Does this outlier influence the slope of the regression line?

Not much...

Which of following is <u>true</u>?

(a) Influential points always change the intercept of the regression line.

(b) Influential points always reduce R^2.

(c) It is much more likely for a low leverage point to be influential, than a high leverage point.

(d) When the data set includes an influential point, the relationship between the explanatory variable and the response variable is always nonlinear.

(e) *None of the above.*

$R = 0.08$, $R^2 = 0.0064$

$R = 0.79$, $R^2 = 0.6241$