

Linear regression

Response variable Y is log of half-life for uranium ($Z = 90$) and thorium ($Z = 88$). Note: Z is atomic number of daughter nucleus.

Y	A	Z	E
6.30	228	90	6.80
14.4	230	90	5.99
21.5	232	90	5.41
29.7	234	90	4.86
34.2	236	90	4.57
39.5	238	90	4.27
7.52	226	88	6.45
17.9	228	88	5.52
28.5	230	88	4.77
40.6	232	88	4.08

Geiger–Nuttall regression model.

$$\hat{Y} = \beta_2 \frac{Z}{\sqrt{E}} + \beta_1 Z^{2/3} + \beta_0$$

By ordinary least squares the best coefficients for the above data are

$$\begin{aligned}\beta_2 &= 3.7 \\ \beta_1 &= -3.058 \\ \beta_0 &= -60.14\end{aligned}$$

The regression formula yields the following predicted values.

Y	\hat{Y}
6.30	6.15
14.4	14.5
21.5	21.6
29.7	29.5
34.2	34.2
39.5	39.6
7.52	7.57
17.9	17.9
28.5	28.4
40.6	40.6

Eigenmath script