Factors that Affect the Standard Error of Coefficient Estimates in OLS Models

Vartanian: SW 540

\[ t_{n-k-1} = \frac{b}{\hat{s}_{b,12}} \]

\[ \hat{s}_{b,12} = \sqrt{\frac{\hat{s}_{y,12}^2}{n \cdot \left( \sum x_1^2 - \frac{(\sum x_1)^2}{n} \right)} \cdot \left[ 1 - r_{12}^2 \right]} \]

Where

\[ \sum x_1^2 \cdot \frac{(\sum x_1)^2}{n} = \sum (x_1 - \bar{x})^2 \]

\[ \hat{s}_{y,12}^2 = \frac{ESS}{n-k-1} \]

where ESS = error sums of squares.

Factors that affect the standard error:
1. Sample size. The larger the n, the smaller will be the standard error.
2. The dispersion of the independent variable, X. The smaller the dispersion, the higher will be the standard error.
3. The mean squared error. The higher this value, the higher will be the standard error.
4. The correlation among independent variables. The higher this correlation, the higher will be the standard error.

Higher or lower standard errors will have an effect on the t value, which then has an impact on the likelihood of statistical significance.

You should understand why each of these 4 factors affect the standard error. For example, a higher correlation among independent variables increases the standard error because higher correlations among independent variables reduce the denominator in the standard error equation, which then increases the overall value for the standard error.