EE23010 NCERT Exemplar

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Question 61.2023
Using the Ordinary Least Squares (OLS) method, a researcher estimated the relationship between initial salary (S) of MBA graduates and their cumulative grade point average (CGPA) as

$$\hat{S}_i = \hat{\beta}_0 + \hat{\beta}_1 \text{CGPA}_i, i = 1, 2, \ldots, 100$$

where $\hat{\beta}_0 = 4543$ and $\hat{\beta}_1 = 645.08$. The standard errors of $\hat{\beta}_0$ and $\hat{\beta}_1$ are 921.79 and 70.01, respectively.
The t-statistic for testing the null hypothesis $\beta_1 = 0$ is

Solution:
t-statistic: It is a measure of how many standard errors a point estimate is away from the hypothesized value.
Standard error: It is a measure of how much the estimator is likely to vary from the true value of the parameter it is estimating.
The t-statistic is derived by dividing the difference between the point estimate and the hypothesized value by the standard error of the estimator. It is given by,

$$t_{\hat{\beta}_1} = \frac{\hat{\beta}_1 - \beta_1}{SE\left(\hat{\beta}_1\right)} \tag{1}$$

where,
- $\hat{\beta}_1$ is the point estimate.
- β_1 is the hypothesized value.
- $SE\left(\hat{\beta}_1\right)$ standard error of the estimator.

Given that $\hat{\beta}_1 = 645.08$ and $SE\left(\hat{\beta}_1\right) = 70.01$, we get

$$t_{\hat{\beta}_1} = \frac{645.08 - 0}{70.01} \tag{2}$$

$$t_{\hat{\beta}_1} = 9.21 \tag{3}$$