

EE23010 NCERT Exemplar

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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

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

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:

Definition 1 (t-statistic). *The t-statistic is the ratio of the difference between the estimated value of a parameter from its hypothesized value to its standard error.*

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

where,

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

Definition 2 (Standard error). *It is a measure of how much the statistic is likely to vary from the true value of the parameter it is estimating.*

$$SE(\hat{\beta}_1) = \sqrt{\frac{s^2}{n-2}} \quad (2)$$

where,

- s^2 is the variance
- n is the sample size

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

$$t_{\hat{\beta}_1} = \frac{645.08 - 0}{70.01} \quad (3)$$

$$t_{\hat{\beta}_1} = 9.21 \quad (4)$$