Assignment-7

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Question 63.2023)Suppose from the estimation of a linear regression model

$$Y_i = \beta_0 + \beta_1 X_i + e_i$$

the residual sum of squares and the total sum of squares are obtained as 44 and 80, respectively. The value of coefficient of determination is (round off to two decimal places).
Solution:

$$Y_i = \beta_0 + \beta_1 X_i + e_i \tag{1}$$

Here

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TABLE 0
PARAMETERS

Parameters	Description
Y_i	Dependent variable
X_i	Independant variables
β_0, β_1	Constant variables
e_i	Error term

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Residual sum of squares(RSS): It measures the extent of variability of observed data not predicted by the regression model. That is it estimates the variance in residual or error term's.

$$RSS = \sum e_i^2 \tag{2}$$
$$= \sum (Y_i - \beta_0 - \beta_1 X_i)^2 \tag{3}$$

Total sum of squares(TSS): It measures the amount of variation measures in observed data. It is a measure of deviation from the mean. A low total sum of squares indicates little variation between data sets while a higher one indicates more variation.

$$TSS = \sum \left(Y_i - \bar{Y}\right)^2 \tag{4}$$

where $\bar{Y}$ = Mean of data
Coeffiecient of determination(R^2): It is the proportion of the variance in the dependent variable that is predicted from the independent variable. It indicates the level of variation in the given data set.

$$R^2 = 1 - \frac{RSS}{TSS} \tag{5}$$
$$= 1 - \frac{44}{80} \tag{6}$$
$$= 0.45 \tag{7}$$

45 percent of the variance in the Y variable is predicted from the X variable.