Regression Coefficients

Regression coefficients are the quantities by which the variables in a regression equation are multiplied. The most commonly used type of regression is linear regression. The aim of linear regression is to find the regression coefficients that produce the best-fitted line.

The regression coefficients in linear regression help in predicting the value of an unknown variable using a known variable. In this article, we will learn more about regression coefficients, their formulas as well as see certain associated examples so as to find the best-fitted regression line.

What are Regression Coefficients?

Regression coefficients can be defined as estimates of some unknown parameters to describe the relationship between a predictor variable and the corresponding response. In other words, regression coefficients are used to predict the value of an unknown variable using a known variable. Linear regression is used to quantify how a unit change in an independent variable causes an effect in the dependent variable by determining the equation of the best-fitted straight line. This process is known as regression analysis.

Formula for Regression Coefficients

The goal of linear regression is to find the equation of the straight line that best describes the relationship between two or more variables. For example, suppose a simple regression equation is given by y = 7x - 3, then 7 is the coefficient, x is the predictor and -3 is the constant term. Suppose the equation of the best-fitted line is given by Y = aX + b then, the regression coefficients formula is given as follows:

the regression coefficients formula is given as follows:

$$a = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2}$$

$$b = \frac{(\sum y)(\sum x^2) - (\sum x)(\sum xy)}{n(\sum x^2) - (\sum x)^2}$$

here, n refers to the number of data points in the given data sets.

Examples on Regression Coefficients

- **Example 1:** Find the regression coefficients for the following data:

Age	Glucose Level
43	99
21	65
25	79
42	75
57	87
59	81

Solution:

Age (x)	Glucose Level (y)	xy	x^2	y^2
43	99	4257	1849	9801
21	65	1365	441	4225
25	79	1975	625	6241
42	75	3150	1764	5625

Age (x)	Glucose Level (y)	xy	x^2	y^2
57	87	4959	3249	7569
59	81	4779	3481	6561
Total = 247	486	20485	11409	40022

The formula for finding the regression coefficients are as follows:

$$a = \frac{n(\sum xy)-(\sum x)(\sum y)}{n(\sum x^2)-(\sum x)^2}$$

$= 0.39$

$$b = \frac{(\sum y)(\sum x^2)-(\sum x)(\sum xy)}{n(\sum x^2)-(\sum x)^2}$$

$= 65.14$

The regression equation is $Y = 0.39X + 65.14$

Answer: a = 0.39 and b = 65.14

Example 3: Plot the graph for the following data if the regression coefficients are given as a = -0.07 and b = 68.63

X	Y
130	55
135	56
140	62
142	63
147	63
156	51

Solution: The regression coefficients are given as a = -0.07 and b = 68.63

Thus, the regression line is Y = -0.07X + 68.63

Thus, the scatter plot can be drawn as follows: