Regression

When there is a relationship between any two variables and the correlation coefficient indicates that this relationship is positive or negative, it is not possible to determine the amount of expected change in the value of a particular variable as a result of increasing the other variable by one unit, so we resort to calculating the regression coefficient, which can be used to know the amount of change in a factor when the value of the other variable increases by one unit.

The regression method is applied to cases in which variables can be classified into dependent variables and independent variables. For example, the percentage of protein in the feed is an independent variable factor and the amount of milk from cows' fields is a dependent factor. The dependent variable is usually symbolized by the symbol (Y) and the independent variable by the symbol (X). It is noted that the dependent variable is affected by the independent variable and does not affect it.

The regression that is limited to only one independent variable is called simple regression, while the regression that includes two or more independent variables is called multiple regression.

The quantitative relationship between the values of the dependent variable and the values of the independent variable, if it represents a simple linear regression, its equation is:

$$y = a + bxi$$

$$b = \frac{\Sigma XiYi - \frac{\Sigma Xi \Sigma Yi}{n}}{\Sigma Xi^2 - \frac{(\Sigma Xi)^2}{n}}$$

$$a = y - b * x$$

Example:

The following data represents (the independent factor X) is (5, 10, 15, 20, 25) and the dependent factor Y represents is (46.8, 44.5, 34.5, 29.8, 25.7), find the simple linear regression equation.

Sol/

1) Calculate the following values: n, ∑Xi, ∑Yi, ∑Xi², ∑Xi*Yi, y, x

Xi²	Xi*Yi	Y	X	
25	234	46.8	5	
100	445	44.5	10	
225	517.5	34.5	15	
400	596	29.8	20	
625	642.5	25.7	25	
1375	2435	181.3	75	Summation
		36.26	15	Average

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n = 5 , ∑Xi=75 , ∑Yi=181.3 , ∑Xi²=1375 ,

∑Xi*Yi=2435

y = 36.26 , x = 15

2) We calculate the value of b from the previous equation, which is equal to:

$$b = \frac{\Sigma XiYi - \frac{\Sigma Xi \Sigma Yi}{n}}{\Sigma Xi^2 - \frac{(\Sigma Xi)^2}{n}}$$

$$b = \frac{2435 - \frac{75 * 181.3}{5}}{(1375)^2 - \frac{(75)^2}{5}} = -1.138$$

Since the value of b is negative, this means that an increase in the values of X leads to a decrease in the values of Y.

3) We calculate the value of a from the previous equation, which is equal to:

$$a = 36.26 - (-1.138) * 15$$

$$a = 53.33$$