

# Regression AND Correlation

**Regression:** can be used for predicting the values of the variable which depends upon other variables.

**Correlation:** attempts to study the strength of mutual relationship b/w two variables.

**Independent variables: "x"**

The value which is decided by the experimenter is called fixed variable or independent variable. It is also called regressor or predictor.

**Dependent variable: "y"** The value of one variable is predicted on the basis of

The variable which is influenced by the independent variable is called dependent variable.

It is also called regressand or predictand.

**Regression Definition:** The value of one variable is predicted on the basis of other variable is known as regression

It is the dependency of one variable on one or more other variables.

**Regression Models:**

dependent variable

$$\hat{y} = \alpha + \beta X + \epsilon \rightarrow \text{for pop}^n$$

independent variable

$$\hat{y} = a + bx + e \rightarrow \text{for sample}$$

where

$\alpha$  = intercept

$\beta$  = slope

$\epsilon$  = Error term. (epsilon)

Example:-

$$\text{Weight} = \alpha + \beta (\text{height}) + \epsilon$$

$$\text{Consumption} = \alpha + \beta (\text{Income}) + \epsilon$$

$$\text{Cgpa} = \alpha + \beta (\text{GPA}) + \epsilon$$

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + \epsilon$$

$$\text{B.P} = \alpha + \beta_1 (\text{age}) + \beta_2 (\text{Cholesterol}) + \beta_3 (\text{Food}) + \beta_4 (\text{tension}) + \beta_5 (\text{weight}).$$

Y on X:-

$$Y = a + bX$$

$$a = \bar{Y} - b\bar{X}$$

$$b = \frac{n \sum XY - \sum X \sum Y}{n \sum X^2 - (\sum X)^2}$$

X on Y:-

$$X = \alpha + \beta Y$$

$$\hat{X} = a + bY$$

$$a = \bar{X} - b\bar{Y}$$

$$b = \frac{n \sum XY - \sum X \sum Y}{n \sum Y^2 - (\sum Y)^2}$$

Question:-

Price (X)	Quantity Sold (Y)	$\sum XY$	$\sum X^2$
25	118	2950	625
45	105	4725	2025
30	112	3360	900
50	100	5000	2500
35	111	3885	1225
40	108	4320	1600
65	95	6175	4225
75	88	6600	5625
70	91	6370	4900
60	96	5760	3600
495	1024	49145	27225