

Concept on Linear Regression

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What is Regression?

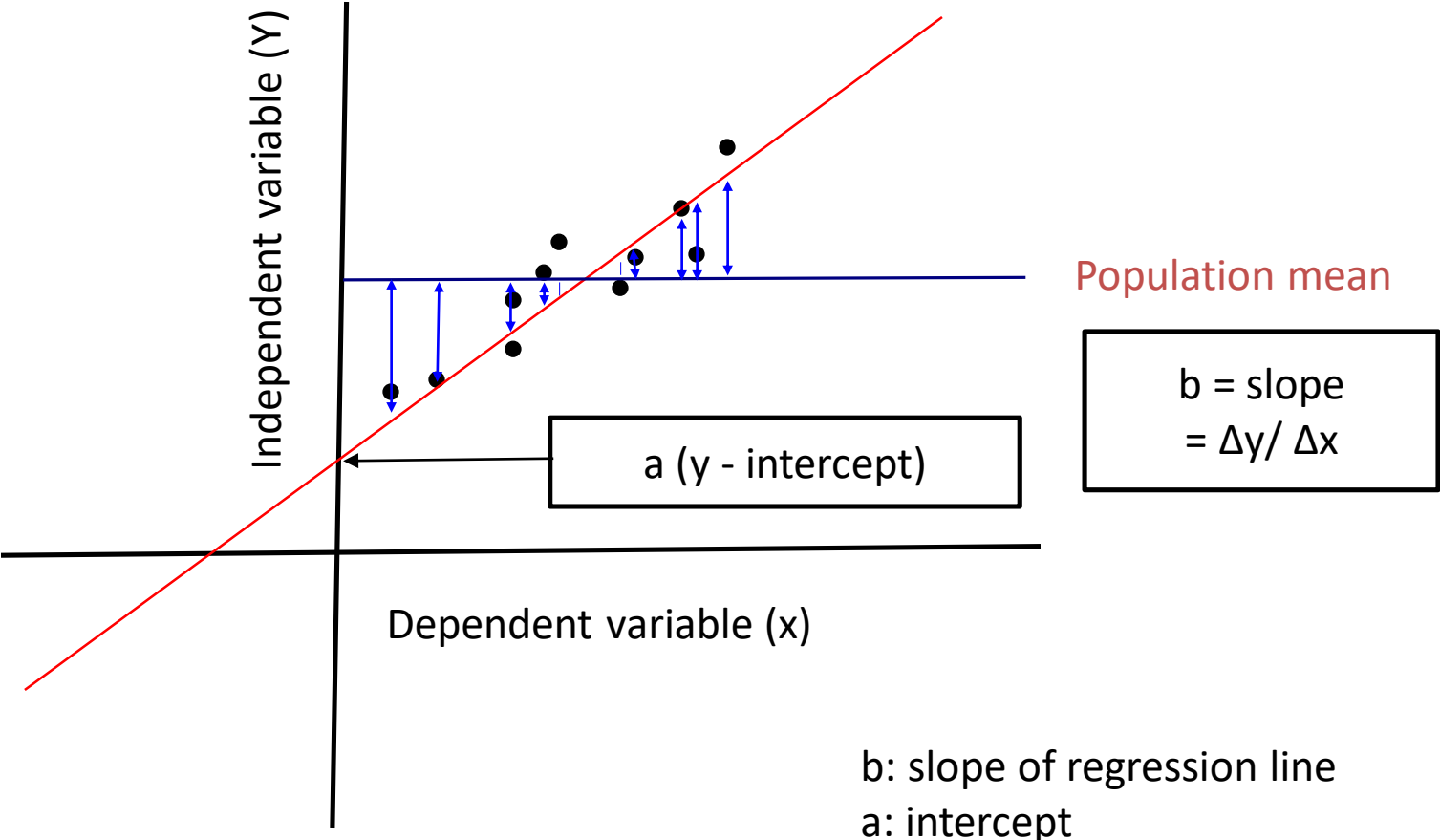
- The dictionary meaning of the word Regression is ‘Stepping back’ or ‘Going back’.
- Regression is the statistical tools which measure the average relationship between dependent and independent variable.
- Dependent variable plotting in X-axis and independent variable plotting in Y-axis.
- Dependent variable denoted by (X) and independent variable denoted by (Y).

Regression

- The dependent variable is variously known as explained variables, predictand, response and endogenous variables.
- While the independent variable is known as explanatory, regressor and exogenous variable.
- Types of Regression
 - Simple linear regression:- one dependent Variable & one independent Variable.
 - multiple regression:- one dependent variable & more than one independent variable.

Regression

$$Y = a + bx$$



THE REGRESSION TECHNIQUE IS PRIMARILY

USED TO :

- Estimate the relationship that exists, on the average, between the dependent variable and the independent variable
- Determine the effect of each of the independent variables on the dependent variable, controlling the effects of all other explanatory variables
- Predict the value of dependent variable for a given value of the independent variable

Difference between Regression and correlation

- Correlation analysis is only concerned relationship between variables.
- Regression analysis is concerned with finding a formula which represents the value of dependent interms of independent variable

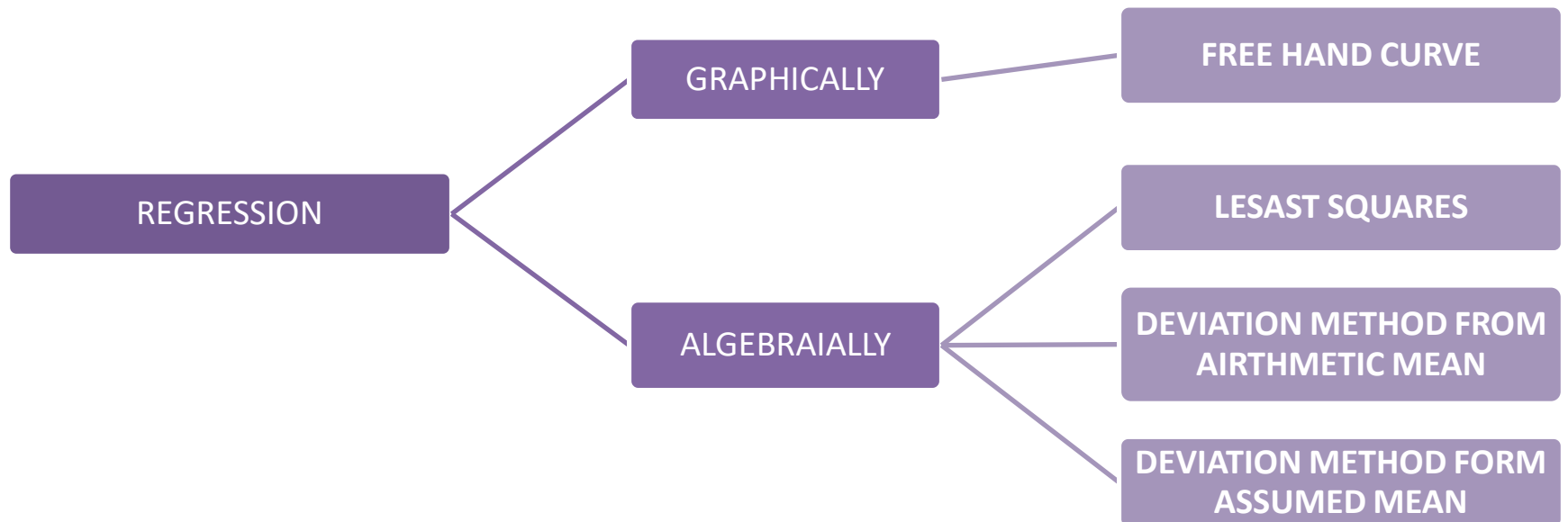
Regression Line

- Regression equation presents the relationship between dependent variable (Y) in terms of independent variable (X) in the form of

$$Y = a + bx$$

- This linear equation is also known as regression line.
- The slope (b) is called as regression coefficient .
- The positive b indicates that as x increases in value the value of y also increases:
- The negative b indicates that as x increases in value the value of y decreases

METHODS OF STUDYING REGRESSION:



least Square Method-:

1. The regression equation of Y on X is: $Y = a+bX$

Where,

Y=Dependent variable X=Independent variable

2. The regression equation of X on Y is : $X = a+bY$

Where,

X=Dependent variable Y=Independent variable

And the values of a and b in the above equations are found by the method of least of Squares-reference . The values of a and b are found with the help of normal equations given below:

$$\sum Y = na + b \sum X$$

$$\sum XY = a \sum X + b \sum X^2$$

$$\sum X = na + b \sum Y$$

$$\sum XY = a \sum Y + b \sum Y^2$$

Example: Find the regression equation on supply on price. Also compute most likely supply when price is Rs.15

X	3	2	7	4	8
Y	6	1	8	5	9

Solution-: Regression equation Y on X :

X	Y	XY	X ²	Y ²
3	6	18	9	36
2	1	2	4	1
7	8	56	49	64
4	5	20	16	25
8	9	72	64	81

$$\sum Y = na + b \sum X \quad \sum XY = a \sum X + b \sum X^2$$

Substitution the values from the table we get

$$29=5a+24b\dots\dots\dots(i)$$

$$168=24a+142b \rightarrow 84=12a+71b\dots\dots(ii)$$

Multiplying equation (i) by 12 and (ii) by 5

$$348=60a+288b\dots\dots\dots(iii)$$

$$420=60a+355b\dots\dots\dots(iv)$$

By solving equation(iii)and (iv) we get

$$**a=0.66 and b=1.07**$$

By putting the value of a and b in the Regression

equation Y on X we get $Y=0.66+1.07X$

Finding regression line using mathematical formula

- Here the Price is independent variable, denoted by X whereas Supply is dependent variable and denoted by Y
- The regression equation of supply on price is given by

$$y = a + bx$$

- Then, solving the two following equations,

$$\Sigma y = na + b \Sigma x \quad \text{and} \quad \Sigma xy = a \Sigma x + b \Sigma x^2$$

we get $a = 0.66$ and $b = 1.7$

- Thus, required regression equation is $y = a + bx$ or

$$y = 0.66 + 1.7x$$

Prediction using regression line

- Regression is used to estimate or predict the unknown value of dependent variable from the known value of the other independent variable(s)
 - First the regression line is fit using the known values of dependent and independent variables. Then value of dependent variable is found putting the value of independent variable in the equation
 - In the above case, $y=0.66+1.7x$
 - When price (x) = Rs. 15, $Y =0.66 +1.7 X =0.66+ 1.7*15 = 26.16$

References:

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