CORRELATION

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CORRELATION

- **Correlation: The degree of relationship between the variables under consideration is measure through the correlation analysis.**
- The measure of correlation called the correlation coefficient
- The degree of relationship is expressed by coefficient which range from correlation **($-1 \leq r \geq +1$)**
- The direction of change is indicated by a sign.
- The correlation analysis enable us to have an idea about the degree & direction of the relationship between the two variables under study.

- Correlation is a statistical tool that helps to measure and analyze the degree of relationship between two variables.
- Correlation analysis deals with the association between two or more variables.

- **Types of Correlation**

Type I

- **Positive Correlation**

- **Negative Correlation**

- **Types of Correlation Type I**

- **Positive Correlation: The correlation is said to be positive correlation if the values of two variables changing with same direction.**

  Ex. Pub. Exp. & sales, Height & weight.

- **Negative Correlation: The correlation is said to be negative correlation when the values of variables change with opposite direction.**

  Ex. Price & qty. demanded.

DIRECTION OF THE CORRELATION

- **Positive relationship–Variables change in the same direction.**
- As X is increasing, Y is increasing
- As X is decreasing, Y is decreasing

  E.g., As height increases, so does weight.
- **Negative relationship–Variables change inopposite directions.**
- As X is increasing, Y is decreasing
- As X is decreasing, Y is increasing

  E.g., As TV time increases, grades decrease

- **More examples**

- **<u>Positive relationships</u>**
  - water consumption and temperature.
  - study time and grades.

    - **<u>Negative relationships:</u>**
      - alcohol consumption and driving ability.
- Price & quantity demanded

- **Types of Correlation Type II**
- **Simple**
- **Multiple**
- **Partial**
- **Total**

- **Types of Correlation Type II**

- **Simple correlation:Under simple correlation problem there are only two variables are studied.**

  - **Multiple Correlation:Under Multiple Correlation three or more than three variables are studied. Ex. Q_d= f (P,P_C, P_S, t, y)**

  - **Partial correlation:analysis recognizes more than two variables but considers only two variables keeping the other constant.**

  - **Total correlation:is based on all the relevant variables, which is normally not feasible.**

- **CorrelationType III**
- **LINEAR**

- **NON LINEAR**

- **Types of Correlation Type III**

- **Linear correlation:Correlation is said to be linear when the amount of change in one variable tends to bear a constant ratio to the amount of change in the other. The graph of the variables having a linear relationship will form a straight line.**

- Ex X = 1, 2, 3, 4, 5, 6, 7, 8,
- Y = 5, 7, 9, 11, 13, 15, 17, 19,
- Y = 3 + 2x
- **Non Linear correlation:The correlation would be non linear if the amount of change in one variable does not bear a constant ratio to the amount of change in the other variable.**

METHODS OF STUDYING CORRELATION

- Karl Pearson's Coefficient of Correlation
- Scatter Diagram Method
- Graphic Method
- Method of Least Squares

- **Karl Pearson'sCoefficient of Correlation**

- Pearson’s ‘r’ is the most common correlation coefficient.
- Karl Pearson’s Coefficient of Correlation denoted by-‘r’ The coefficient of correlation ‘r’ measure the degree of linear relationship between two variables say x & y.

- **Assumptions of Pearson's Correlation Coefficient**

- There is linear relationship between two variables, i.e. when the two variables are plotted on a scatter diagram a straight line will be formed by the points.
- Cause and effect relation exists between different forces operating on the item of the two variable series.

KARL PEARSON'S COEFFICIENT OF CORRELATION

- Karl Pearson’s Coefficient of Correlation denoted by-r
- $-1 \leq r \geq +1$

- Degree of Correlation is expressed by a value of Coefficient
- Direction of change is Indicated by sign
- (-ve) or (+ ve)

- When deviation taken from actual mean:**$r(x, y) = \Sigma xy / \sqrt{\Sigma x^2 \Sigma y^2}$**
- When deviation taken from an assumed mean:
- **$r = N \Sigma dxdy - \Sigma dx \Sigma dy$**

- **Procedure for computing the correlation coefficient**

- Calculate the mean of the two series ‘x’ &’y’
  - Calculate the deviations ‘x’ &’y’ in two series from their respective mean.
  - Square each deviation of ‘x’ &’y’ then obtain the sum of the squared deviation i.e.Σx^2& .Σy^2
  - Multiply each deviation under x with each deviation under y & obtain the product of ‘xy’.Then obtain the sum of the product of x , y i.e. Σxy
- Substitute the value in the formula.

- **Interpretation of Correlation Coefficient (r)**

- The value of correlation coefficient ‘r’ ranges from -1 to +1
  - If r = +1, then the correlation between the two variables is said to be perfect and positive
  - If r = -1, then the correlation between the two variables is said to be perfect and negative
- If r = 0, then there exists no correlation between the variables

- **Properties of Correlation coefficient**

- The correlation coefficient lies between -1 & +1 symbolically ($-1 \leq r \geq 1$)
  - The correlation coefficient is independent of the change of origin & scale.
  - The coefficient of correlation is the geometric mean of two regression coefficient.
- $r = \sqrt{} bxy * byx$
- The one regression coefficient is (+ve) other regression coefficient is also (+ve) correlation coefficient is (+ve)

- **Advantages of Pearson's Coefficient**

- It summarizes in one value, the degree of correlation & direction of correlation also.

- **Limitation of Pearson's Coefficient**

- Always assume linear relationship
- Interpreting the value of r is difficult.
- Value of Correlation Coefficient is affected by the extreme values.
- Time consuming methods

THANK YOU