D.D.R College of Management and Technology

Notes - Business statistics

B.B.A IInd Semester

Statistic

Statistics is a science that has deep relation with state. It can be called as the science of counting, science of averages, science of the measurement of social organism, science of estimates and probabilities, art of handling aggregate of facts, science of collection, presentation, analysis and interpretation of numerical data and many more.

3. May not give the best solution

There are many problems in which methods other than statistical approach, suggest the best solution. The conclusions made on the basis of statistics need to be verified using the conclusions made using qualitative methods.

4. Data homogeneity and uniformity

To compare data, it is essential that collected data must be uniform and homogeneous. Comparison of heterogeneous data is not possible.

5. Can be used only by experts

It is only an expert who can make the best possible use of statistics. In the words of Yule, "Statistical methods are most dangerous tools in the hands of inexperts."

Applications of Statistics

Statistics has wide applications in almost every sphere of human activity. Some of the applications of statistics in various fields are listed below:

1. **Economics :-**

Statistics is the basis for Economics. Various economists depend on statistics to measure economic aggregates such as gross national output, consumption, expenditure, balance etc.

2. **Politics :-**

Statistics plays an important role in the field of Politics also. The politicians need to be fully aware of the statistical data of the regions under their charge. A successful politician is the one who analyses statistical data and applies it in an intelligent manner.

3. **Science :-**

Statistical has its importance in the field of Science and Research.

Tabulation

Tabulation refers to an ordered and systematic arrangement of data in columns and rows. It is the orderly presentation of numerical data in a form designed to explain the problem under consideration.

Parts of a Table

1. Table Number

If more than one table are involved, they must be numbered in a logical sequence. This facilitates tables to be used as references and makes it easier to locate them.

2. Title

A table must have a title written in bold letters which should be simple, clear and short. The title explains the data contained in table and to what it relates.

7. Foot Note

Additional notes placed for clarification of the reader are called Foot notes. They are placed directly below the body of the table. They are helpful when table info is not self - explanatory.

8. Source Note

If data entered in the table has been taken from other sources, it is must to mention the source of data. This facilitates the reader to locate original data if desired. They are placed below the foot note.

Types of Table

According to the consteruction of tables & tables are classified into two types:

1. Simple / One Way Table
2. Complex Table

two characteristics of data. It provides information about two inter related characteristics.

Consider the table of number of students → boys and girls studying in various streams of a college as follows:

	Number of Students		
Streams	Number of girls	Number of boys	Total
Maths	20	15	35
Physics	10	18	28
Chemistry	12	20	32
Biology	15	16	31
Total	57	69	126

This is an example of a double table.

(b) Treble Table

Treble table or three-way table shows three characteristics of data. It provides information about three inter related characteristics. consider the table of number of studying in various streams of a college as follows:

Graphs

The Data which are not related to any time period are represented through graphs of frequency distribution. The values of concerned variables get repeated a number of times.

Types of Graph

1. Line Frequency Graph

The graph which represents a discrete frequency distribution on graph paper is known as Line Frequency graph. As the name suggests, Frequencies are displayed using vertical straight lines.

2. Histogram

The graph constructed by making a rectangular column upon class-intervals such that column heights are in proportion to their frequencies.

Advantages of Graphs

Following are the advantages or uses of graphs:

1. Graphs help the reader to study variations in the values of variables using a curve or straight lines.

2. Graphs look attractive and draw the attention of readers.

3. Graphs are easy to draw and simple to understand.

4. Graphs give bird's eye view to the whole mass of collected data.

5. Graphs are applied for forecasting, interpolation, extrapolation etc.

6. Using graphs, a statistician can ascertain the values of mode, median, quartiles etc.

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Measure of Central tendency

Measure of central tendency or average or measure of location is the value of variable which tends to lie centrally with values of the variables. It is the quantity around which the whole data tends to cluster

Arthmatic Mean

Arithmetic Mean is the most widely used measure of Central tendency. It can be called 'mean' alone.
Mean is the number obtained by adding all the values of the variables in a series and dividing the result by the number of quantities.

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For Individual Series

- First arrange given Series in ascending or descending order
- Let n be the number of terms, then

If n is odd: M = Value of $\left(\frac{n+1}{2}\right)$th term

If n iss even: M = mean of values of $\left(\frac{n}{2}\right)$th and $\left(\frac{n+1}{2}\right)$th terms.

For frequency distribution, two Cases arise

Case I = Discrete Series

- Arrange given Series in ascending or descending order
- Prepare cumulative frequency table.
- Let N = Σf_i be total frequency, then

M = Value of $\left(\frac{N+1}{2}\right)$th term

Case II = Continuous series

- Find the Median class (i.e, the class in which $\frac{N}{2}$ th item lies)

- If l: lower limit of median class
  h: width of Median class interval
  f: frequency of median class
  c: cumulative frequency of class preceding the median class

$$M = l + \frac{\left(\frac{N}{2} - C\right)}{f} h$$

⇒ Merits of Median

- It is well defined
- Median is simple to understand and easy to calculate.
- Median can be located on graph with the help of ogives
- It is not affected by extreme values.

⇒ Demerits of Median.

- Further algebraic treatment of Median is not possible.

l = lower limit of modal class (maximum frequency class)
h = width of modal class
f_m = frequency of modal class
f_1 = frequency of pre modal class
f_2 : frequency of post modal class

⇒ Merit of Mode

- It is Simple to Understand and easy to Calculate. In Some cases, mode can be located just by inspection.
- It remains Unaffected by extreme values
- Mode Can be located on grap with the help of Histogram

⇒ Demerits of Mode

- It is not rigidly / precisely defined
- Mode is not based on all the values of observation
- Further algebraic treatment is not possible.

2) Quartile Deviation

Quartile deviation is half of the difference between the Upper quartile (Q_3) and the lower quartile (Q_1).

Formula $\frac{Q_3 - Q_1}{2}$

Coefficient of Q.D $\frac{Q_3 - Q_1}{Q_3 + Q_1}$

Q_1 = Value of $\left(\frac{n+1}{4}\right)$th term

Q_3 = Value of $\left(\frac{3(n+1)}{4}\right)$th term

3) Mean deviation

Mean, also known as average deviation, is the arithmetic average of the deviation of various terms of given Series computed from measure of Central tendency Such as Mean or Median.

$$\sigma = \sqrt{\frac{\Sigma d_i^2}{n}}$$

$$d_i = x - \bar{x}$$

Cofficient of Standard deviation

$$S.D = \frac{\sigma}{\bar{x}}$$

⑦ For frequency distribution

$$\sigma = h\sqrt{\frac{\Sigma f_i v_i^2}{N} - \left(\frac{\Sigma f_i v_i}{N}\right)^2}$$

Variance

Variance is the Square of Standard deviation. It was first used by R.A Fisher

It is denoted by σ^2

Formula

$$Var = (S.D)^2 = (\sigma)^2$$

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UNIT - III

Correlation :-

Correlation refers to the statistical technique used to measure the degree of relationship between two or more variables. It is the analysis of covariation between two or more variables.

Types of Correlation :-

(A.) Positive and Negative Correlation

(B.) Simple, Partial and Multiple Correlation

(C.) Linear and Non-Linear Correlation

A). Positive and Negative Correlation

i) Positive or direct Correlation :- if two variables deviate in the same direction

2. Partial Correlation :-

The study of correlation between three or more variables by considering two variables, keeping other variables fixed is called Partial correlation.

example :- Relation between Volume and Temperature at constant Pressure.

3. Multiple Correlation :-

The study of correlation between three or more variables is called Multiple Correlation.

example :- Relation between Age, Height, weight.

C. Linear and Non-Linear Correlation

on the basis of ratio of change between variables under study, correlation may be classified as :-

1. Linear Correlation :-

If ratio of change in value of two variables remains constant throughout then correlation is called linear correlation.

Mathematically, two variables X and Y are linearly correlated if, $\frac{\Delta y}{\Delta x}$ = constant

$$r = \frac{\Sigma(x-\bar{x})(y-\bar{y})}{\sqrt{\Sigma(x-\bar{x})^2}\sqrt{\Sigma(y-\bar{y})^2}}$$

$x = X - \bar{X}$, $y = Y - \bar{Y}$

σ_x = S.D of X

σ_y = S.D of Y

N denotes the number of pairs of observation.

$$r = \frac{\Sigma xy}{N\sigma_x \sigma_y}$$

★ Rank Correlation Method :-

This method is also know as spearmans Rank Correlation. It is used to study correlation when quantitative measures of certain factor cannot be fixed. Rank correlation helps to determine the correlation between qualitative data such as IQ, honesty, intelligence etc. Here variables are assigned rank and their measurement (quantity) is not possible.

formula :—

$$R = 1 - \frac{6\Sigma D^2}{N(N^2-1)}$$

Two lines of Regression

The two regression equations are :-

$$y = a + bx$$
$$x = a + by$$

The Regression line of y on x is :-

$$y - \bar{y} = b_{yx}(x - \bar{x})$$

$$b_{yx} = \frac{\Sigma xy}{\Sigma x^2}$$

The Regression line of x on y is :-

$$x - \bar{x} = b_{xy}(y - \bar{y})$$

$$b_{xy} = \frac{\Sigma xy}{\Sigma y^2}$$

Differentiate between correlation and regression

Correlation	Regression
1. Correlation helps in analysing relationship between two or more variables	1. Regression shows the relationship between the dependent and independent variables.
2. It does not help in prediction.	2. It predicts values of dependent variable for a value of independent variable.
3. Correlation x on y and y on x are same. i.e. there is one correlation coeff. 'r'	3. Regression coefficients bxy and byx are not same. i.e. there are two regression coeff. for two regression lines
4. Correlation coefficients are independent of the change of origin and scale.	4. Regression coefficients are independent of change of origin but not of sale. scale.
5. Correlation does not always assume cause and effect relationship between	5. Regression follows cause and effect relationship between two variable