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5. Ratio graph

It is also called semilogarithemic graph.

The absolute changes in the values of a variable from one period to another can be shown on natural (or) arithmetic scale.

when relative rates of change are to be studied logarithmic (or) ratio scale is used.

In ratio scale equal vertical distances indicate equal relative rates of change (or) equal percentage.

The Natural scale is based on arithmetic progression where as the ratio scale is based on geometric progression.

The ratio chart (or) ratio scale enable us to compare the rate of change of categories of different statistical units on the same chart. Many curves can be plotted on the same graph and their trends studied.

In case of ratio scale, the Y-axis start from one and not from zero whereas in the case of the scale on semi-logarithmic paper starting at 1 and not zero is that the logarithm of 1 is 0. Hence 1 is placed at zero distance from the origin.

There is no logarithm for zero, nor for -ve numbers, hence such values cannot be plotted.

On the logarithmic scale chart, constant rate of increase or decrease can be easily noticed and this property is of great use.

In case of variables having wide range of values the ratio scale graph is far more suitable than the other.

In ratio scale the meaning of the data is derived from the direction of lines whereas in case of natural scale the meaning is derived from position of lines.

Methods of constructing a semi-logarithmic graph

A semi-logarithmic graph can be constructed in any of the following ways.

1. By plotting the logarithmic of the given values on a natural scale.

2. By plotting the given values on a semi-logarithmic paper.

when first method is adopted the logarithms of the various values of variable are obtained by consulting the logarithmic tables. These logarithms are then plotted on y-axis of the natural scale and the various points are joined by straight lines.

when second method is adopted, no need to find log values to the variables, rather the actual values are plotted on semi-logarithmic paper. This method is simple and convenient as compared to the first method.

when a graph is prepared by following any of the above two methods, it is known as semi-logarithmic graph, here vertical scale is ruled on the ratio principle but the horizontal scale remains on the arithmetic principle.

It is also possible to have a line graph that has both the scales logarithmic. such a graph is known as a double logarithmic graph and the use of this graph is limited.

Interpretation of logarithmic curves :-

the logarithmic curves must be interpreted with caution, otherwise there is a possibility of jumping to wrong conclusions, The following are some of the important points.

1. If a curve is raising upwards, it would indicate an increasing rate of change.
2. If the curve is falling downwards, it represents a decreasing rate of change.
3. If a curve is a straight line, the rate of change is constant (or) uniform.
4. If a curve is rising but is nearly straight, it represents a decline at a nearly uniform rate.
5. If a curve is steeper in one portion than in another portion, the rate of change in the former is more rapid than that in the latter.
6. If two curves on the same ratio chart are found running parallel, they represent equal percentage of change.
7. If one curve is steeper than another on the same ratio chart, the rate of change in the former is more rapid than that in the latter.

Uses of ratio chart :-

Ratio graphs are useful for 4 types of comparision.

1. A constant percent rate of growth is represented by a straight line such as the sales increasing 10 percent a year appear on the ratio chart as straight line. If the series curves are away from the straight line, it denotes a corresponding change in the rate of growth.

2. If historic factors of growth may be expected to persist, the analyst can project past trends, in order to forecast future volumes.
3. The relative growth of fluctuation of two curves may be compared more accurately in ratio charts than in arithmetic charts since parallel lines indicates the same percent rates of change anywhere on the chart and steeper slopes indicate higher rates.
4. percentages (or) ratios may be read directly from the vertical scale and applied towards further. graphic analysis.
5. Ratio scale is extremely useful in comparing series which differ widely in magnitude.

Limitations:-

1. They are difficult to understand.
2. Zero (or) Negative values cannot be shown.
3. The study of an aggregate into various component parts is not possible by using ratio scale.
4. Their interpretation needs highly specialised knowledge in the absence of which one may draw entirely wrong conclusions. This factor alone restricts the scope of mass popularity of such a useful
5. Ratio scale cannot measure absolute changes.

Types of frequency distribution Graphs:-

A frequency distribution can be presented graphically in any of the following ways.

1. Histograms
2. frequency polygon
3. Smoothed frequency curve
4. ogives (or) cumulative frequency curves.

1. Histograms:-

Histogram is most widely used for graphical representation of a frequency distribution. while constructing histogram the variable is always taken on x-axis and frequencies depending on it (or) on y-axis. The area of the histogram represents the total frequency as distributed through out the classes. Histogram is a two dimensional i.e., length and width are important.

The technique of constructing histogram is

(i) for distributions have equal class intervals.

(ii) for distributions having unequal class intervals.

when class intervals are equal, take frequency on y-axis, the variable on x-axis and construct adjacent rectangles. In such case height of the rectangles will be proportional to the frequencies.

when class intervals are unequal, a correction for unequal class intervals must be made, The correction consists of find a each class the frequency density (or) the relative frequency density. The frequency density is the frequency for that class divided by the width of the class.

A Histogram (or) frequency density polygon constructed from these density values would have the same general appearance as the corresponding graphical display developed from equal class interval.

For adjustment take the class which has lowest class - interval and adjust the frequencies of other classes in the following way. If one class interval is twice as wide as the one having lowest

class interval, divide the height of the rectangle by two. If it is three time more, divide the height of it rectangle by three etc... i.e., the heights will be proportional to the ratios of the frequencies of the width of the class.

2. Frequency polygon :-

A frequency polygon is a graph of frequency distribution. It has more than four sides. It is particularly effective in comparing 2 or more frequency distributions. There are 2 ways to construct a frequency polygon.

1. Draw a histogram of the given data and then join by straight lines the midpoints of the upper horizontal side of each rectangle with the adjacent ones. The figure so obtained is called frequency polygon. practice to close the polygon at both ends of the distribution by extending them to base line of making the area under polygon equal to the area under the corresponding histogram.

2. Another method is to take the class midpoints of the various class intervals and then plot the frequency corresponding to each point and join these points by straight lines. The figure so obtained is same as by the model 1 but the only difference is there here we have not to construct histogram.

Advantages :-

1. In a frequency polygon the values of mode can be easily obtained if from the apex of a Polygon a far is drawn on x-axis.

2. It facilitates comparision of 2 (or) more frequency distribution on the same graph.
3. Frequency polygon is simpler than its histogram.
4. It sketches an outline of the data pattern more clearly.
5. Polygon becomes increasingly smooth and curve like as we increase the number of classes and no. of observation.

Same as in histogram difficulties are faced in the construction of a frequency polygon i.e., they cannot be used for distributions having open end classes. To avoid it make an adjustment same as in histogram.

3. Smoothed frequency curve :-

A smoothed frequency curve can be drawn through the various points of the polygon. The curve is drawn freehand in such a manner that the area included under the curve is approximately same as of polygon. The objective is to eliminate the accidental variations present in the data. For drawing a smoothed frequency curve it is necessary to first draw the polygon and then smooth it out, while constructing polygon by plotting the frequencies at the mid point of class intervals save some time but the smoothing of the polygon cannot be done properly without a histogram.

i.e., first draw histogram then polygon and lastly smoothen it. The curve should begin and end

at the base line and as a general rule it may be extended to the midpoints of the class intervals just outside the histogram.

The area under the curve should represents the total number of frequencies in the entire distribution.

The following points are important while smoothing a frequency curve.

1. only frequency distribution based on samples should be smoothed.
2. only continuous series should be smoothed.
3. The total area under the curve should be equal to the area under the original histogram (or) polygon.

4. Cumulative frequency curves (or) ogives :-

It is a graphical representation of cumulative frequency distribution. An ogive is obtained by plotting the cumulative frequency on Y-axis against the class boundaries on x-axis.

Types of ogive curves : there are 2 types

1. Less than ogive
2. More than ogive

1. Less than ogive :-

It is constructed on the basis of cumulative frequencies which are in ascending order. In less than ogive, cumulative frequencies are plotted against upper limits of respective class. It is an increasing curve which has an upward slope from left to right.

2. More than ogive:

It is constructed on the basis of cumulative frequencies which are in descending order. In more than ogive, cumulative frequencies are plotted against lower limits of respectives class. It is a decreasing curve which has downwards slope from left to right.

Uses of ogives:-

1. It helps to determine graphically the number of proportion observation above (or) below the given value of variable.
2. It also helps to complete partition values such as median and quartiles graphically.
3. It facilitates the comparision of two frequency distributions.

Differences between Histogram and Histrogram

Histogram shows vertical adjacent rectangles with class intervals on x-axis and corresponding frequencies on y-axis. Histogram shows changes in variable over a period of time with time periods on x-axis and values of variable on y-axis.

For example; Scale (or) population ~~of variable~~ over a period of 10 years from 2001 to 2010

Basics of distinction	Histogram	Histrogram
1. curve / diagram	It is an area diagram.	It is a frequency curve
2. Type of Graph	It is a graph of frequency distribution.	It is a graph of time series.
3. x-axis	It shows class intervals on x-axis	It shows time-period on x-axis.
4 y-axis	It shows frequencies of class intervals on y-axis.	It shows the values of a variable on y-axis.