Measurement Scales- Nominal, Ordinal, Interval, Ratio

The level of measurement refers to the relationship among the values that are assigned to the attributes, feelings or opinions for a variable. Typically, there are four levels of measurement scales or methods of assigning numbers:

a) Nominal Scale:

Nominal Scale is the crudest among all measurement scales but it is also the simplest scale. In this scale the different scores on a measurement simply indicate different categories. The nominal scale does not express any values or relationships between variables.

The nominal scale is often referred to as a categorical scale. The assigned numbers have no arithmetic properties and act only as labels. The only statistical operation that can be performed on nominal scales is a frequency count. We cannot determine an average except mode.

For example: labeling men as '1' and women as '2' which is the most common way of labeling gender for data recording purpose does not mean women are 'twice something or other' than men. Nor it suggests that men are somehow 'better' than women.

Characteristics of Nominal Scale

1. In nominal scale a variable is divided into two or more categories, for example, agree/disagree, yes or no etc. It's is a measurement mechanism in which answer to a particular question can fall into either category.

2. Nominal scale is qualitative in nature, which means numbers are used here only to categorize or identify objects. For example, football fans will be really excited, as the football world cup is around the corner! Have you noticed numbers on a jersey of a football player? These numbers have nothing to do with the ability of players; however, they can help identify the player.

3. In nominal scale, numbers don't define the characteristics related to the object, which means each number is assigned to one object. The only permissible aspect related to numbers in a nominal scale is "counting."

b) Ordinal Scale:

Involves the ranking of items along the continuum of the characteristic being scaled. In this scale, the items are classified according to whether they have more or less of a characteristic.

The main characteristic of the ordinal scale is that the categories have a logical or ordered relationship. This type of scale permits the measurement of degrees of difference, (i.e. 'more' or 'less') but not the specific amount of differences (i.e. how much 'more' or 'less'). This scale is very common in marketing, satisfaction and attitudinal research. Using ordinal scale data, we can perform statistical analysis like Median and Mode, but not the Mean.

For example, a fast food home delivery shop may wish to ask its customers: How would you rate the service of our staff? (1) Excellent (2) Very Good (3) Good (4) Poor (5) Worst

Ordinal Scale Characteristics

- Along with identifying and describing the magnitude, the ordinal scale shows the relative rank of variables.
- The properties of the interval are not known.
- Measurement of non-numeric attributes such as frequency, satisfaction, happiness etc.
- In addition to the information provided by nominal scale, ordinal scale identifies the rank of variables.
- Using this scale, survey makers can analyze the degree of agreement among respondents with respect to the identified order of the variables.

c) Interval Scale:

Interval Scale is a scale in which the numbers are used to rank attributes such that numerically equal distances on the scale represent equal distance in the characteristic being measured. An interval scale contains all the information of an ordinal scale, but it also one allows to compare

the difference/distance between attributes. Interval scales may be either in numeric or semantic formats.

The interval scales allow the calculation of averages like Mean, Median and Mode and dispersion like Range and Standard Deviation.

For example, the difference between '1' and '2' is equal to the difference between '3' and '4'. Further, the difference between '2' and '4' is twice the difference between '1' and '2'.

Measuring temperature is an example of interval scale. But, we cannot say 40°C is twice as hot as 20°C.

Characteristics of interval scale

1. The interval scale is preferred to nominal scale or ordinal scale because the latter two are qualitative scales. The interval scale is quantitative in the sense that it can quantify the difference between values.
2. Interval data can be discrete with whole numbers like 8 degrees, 4 years, 2 months, etc., or continuous with fractional numbers like 12.2 degrees, 3.5 weeks or 4.2 miles.
3. You can subtract values between two variables that help understand the difference between two variables.
4. Interval measurement allows you to calculate the mean and median of variables.
5. Interval data is especially useful in business, social, and scientific analysis and strategy because it is straightforward and quantitative.
6. This is a preferred scale in statistics because you can assign a numerical value to any arbitrary assessment, such as feelings and sentiments.

d) Ratio Scale:

Ratio Scale is the highest level of measurement scales. This has the properties of an interval scale together with a fixed (absolute) zero point. The absolute zero point allows us to construct a meaningful ratio.

Ratio scales permit the researcher to compare both differences in scores and relative magnitude of scores. Examples of ratio scales include weights, lengths and times.

For example, the number of customers of a bank's ATM in the last three months is a ratio scale. This is because you can compare this with previous three months.

For example, the difference between 10 and 15 minutes is the same as the difference between 25 and 30 minutes and 30 minutes is twice as long as 15 minutes.

Characteristics of Ratio Scale

1. Ratio scale, as mentioned earlier has an absolute zero characteristic. It has orders and equally distanced value between units. The zero point characteristic makes it relevant or meaningful to say, "One object has twice the length of the other" or "is twice as long."

2. Ratio scale doesn't have a negative number, unlike interval scale because of the absolute zero or zero point characteristic. To measure any object on a ratio scale, researchers must first see if the object meets all the criteria for interval scale plus has an absolute zero characteristic.

3. Ratio scale provides unique possibilities for statistical analysis. In ratio scale, variables can be systematically added, subtracted, multiplied and divided (ratio). All statistical analysis including mean, mode, and the median can be calculated using ratio scale. Also, chi-square can be calculated on ratio scale variable.

4. Ratio scale has ratio scale units which have several unique and useful properties. One of them is they allow unit conversion. Take an example of calculation of energy flow. Several units of energy occur like Joules, gram-calories, kilogram-calories, British thermal units. Still more units of energy per unit time (power) exist kilocalories per day, liters of oxygen per hour, ergs, and Watts.