LECTURE 16 SCALING

DR.GAURAV SANKALP

INTRODUCTION: MEANING OF SCALE

Scale analysis is a set of methods to analyze survey data, in which responses to questions are combined to measure a latent variable. These items can be dichotomous (e.g. yes/no, agree/disagree, correct/incorrect) or polytomous (e.g. disagree strongly /disagree /neutral /agree/agree strongly). Any measurement for such data is required to be reliable, valid, and homogeneous with comparable results over different studies It is nothing but a standardized process of assigning numbers or symbols to certain characteristics of the objects of interest, according to some predefined rules. Measurement actually is a pre-requisite to any mathematical or statistical analysis of data. Measurement scales are used to categorize and/or quantify variables and help in collection and analysis phase of any research. This chapter describes the four scales of measurement that are commonly used in statistical analysis: nominal, ordinal, interval, and ratio scales.

MEASUREMENT OF SCALE

Measurement scales are used to categorize and/or quantify variables. This lesson describes the four scales of measurement that are commonly used in statistical analysis: nominal, ordinal, interval, and ratio scales.

Properties of Measurement Scales

Each scale of measurement satisfies one or more of the following properties of measurement.

- **Identity:** Each value on the measurement scale has a unique meaning.
- **Magnitude**: Values on the measurement scale have an ordered relationship to one another. That is, some values are larger and some are smaller.
- **Equal intervals**: Scale units along the scale are equal to one another. This means, for example, that the difference between 1 and 2 would be equal to the difference between 19 and 20.
- **A minimum value of zero**: The scale has a true zero point, below which no values exist.

NOMINAL SCALE OF MEASUREMENT

The nominal scale of measurement only satisfies the identity property of measurement. Values assigned to variables represent a descriptive category, but have no inherent numerical value with respect to magnitude.

Gender is an example of a variable that is measured on a nominal scale. Individuals may be classified as "male" or "female", but neither value represents more or less "gender" than the other. Religion and political affiliation are other examples of variables that are normally measured on a nominal scale.

ORDINAL SCALE OF MEASUREMENT

The ordinal scale has the property of both identity and magnitude. Each value on the ordinal scale has a unique meaning, and it has an ordered relationship to every other value on the scale.

An example of an ordinal scale in action would be the results of a horse race, reported as "win", "place", and "show". We know the rank order in which horses finished the race. The horse that won finished ahead of the horse that placed, and the horse that placed finished ahead of the horse that showed. However, we cannot tell from this ordinal scale whether it was a close race or whether the winning horse won by a mile.

INTERVAL SCALE OF MEASUREMENT

The interval scale of measurement has the properties of identity, magnitude, and equal intervals. A perfect example of an interval scale is the Fahrenheit scale to measure temperature. The scale is made up of equal temperature units, so that the difference between 40 and 50 degrees Fahrenheit is equal to the difference between 50 and 60 degrees Fahrenheit.

With an interval scale, you know not only whether different values are bigger or smaller, you also know *how much* bigger or smaller they are. For example, suppose it is 60 degrees Fahrenheit on Monday and 70 degrees on Tuesday. You know not only that it was hotter on Tuesday; you also know that it was 10 degrees hotter.

RATIO SCALE OF MEASUREMENT

The ratio scale of measurement satisfies all four of the properties of measurement: identity, magnitude, equal intervals, and a minimum value of zero. The weight of an object would be an example of a ratio scale. Each value on the weight scale has a unique meaning, weights can be rank ordered, units along the weight scale are equal to one another, and the scale has a minimum value of zero.

Weight scales have a minimum value of zero because objects at rest can be weightless, but they cannot have negative weight.