BUSINESS STATISTICS (ISD 152)

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COURSE OUTLINE

- Introduction to Statistics
- Classification of Data
- Measures of Location
- Measures of Variation
- The Normal Distribution
- Correlation and Regression
- Probability Concepts

ASSESSMENT

- Assignments, quizzes and end-of-semester examinations are continually used to obtain information about student performance.

- Continuous assessment (30%)
  - Group Assignment – 10%
  - Class Exercise/ Quizzes – 10%
  - Mid-Sem – 10%

- End-of-semester examination (70%)

CHAPTER ONE

INTRODUCTION TO STATISTICS FOR BUSINESS STUDENTS

SESSION OUTLINE

- History of Statistics
- Modern Definition of Statistics
- Why Study Statistics
- Types of Statistics
- Statistical terms
- Variables
- Levels of Measurement

HISTORY OF STATISTICS

- The Development of Statistics
  - Related to official statistics

    First used by a German Professor Gottfried Achenwall about 1770.

  - As an academic discipline

    Can be traced from the work of Pascal and Bernoulli in the 17th Century.

MODERN DEFINITION OF STATISTICS

- **Statistics (in a plural sense)** – *The term 'statistics,' is used to indicate a group of numbers or collections of numerical data.*

- ***Statistics (in a singular sense)*** *– Statistics is the science that studies methods and procedures for collecting, organizing, presenting, analysing and interpreting numerical data to assist in making more effective decisions and for other useful purposes.*

MODERN DEFINITION OF STATISTICS

- **The definition highlights some main points which are worth considering:**
  - *Numerical Data*
  - *Collection of data*
  - *Organisation and Classification of Data*
  - *Presentation of Data*
  - *Analysis of Data*
  - *Interpretation of Data*

WHY STUDY STATISTICS?

- For the purposes of decision-making in the processes below:
  - To determine whether the existing information is adequate or additional information is required.
  - To gather additional information, if it is needed, in such a way that it does not provide misleading results.
  - To summarise the information in a useful and informative manner.
  - To analyse the available information.
  - To draw conclusions and make inferences while assessing the risk of an incorrect conclusion.

WHY STUDY STATISTICS?

- In summary we study statistics because:
  - Data is everywhere,
  - Statistical techniques are used to make many decisions that affect our lives and,
  - No matter what your future line of work, you will make decisions that involve data.

STATISTICAL TERMS (1)

- ***Population*** – is simply the complete set of data being studied. In other words, it is a collection of all possible individuals, objects, or measurements of specific interest. To infer something about a population, we usually take a sample from the population.

- ***Sample*** **-** is a subset of a population. In other words, it is a portion or part of the population of interest.

STATISTICAL TERMS (2)

- ***Data Set*** **-** A collection of data values forms a Each value in the data set is called a **data value** or a **datum**
- ***Elements*** **-** The entities on which data are collected
- ***Observation*** **-** The set of measurements obtained for a particular element
- ***Sample survey*** **-** A survey to collect data on a sample.
- ***Census*** **-** A survey to collect data on the entire population
- ***Random Variables*** **-** Variables whose values are determined by chance

TYPES OF STATISTICS

- ***Descriptive statistics*** – is concerned with the description, presentation and summarization of a set of data in an informative way.

- ***Inferential Statistics (also inductive statistics)*** – is concerned with drawing conclusions regarding a population of interest on the basis of a small part of that information (sample).

VARIABLES

- A **variable** – is a characteristics or attribute that can assume any of a prescribed set of values, called the domain of the variable. If the variable can assume only one value, it is known as **constant.** Variables can be represented by symbols such as X, Y, H, *x* or B

- ***Types of Variables include:***
  - qualitative
  - quantitative

Types of Variables

- **Qualitative variables** (also called attributes) are **non-numeric**. They are variables that can be placed into distinct categories, according to some characteristic or attribute. For example, if subjects are classified according to gender (male or female), then the variable 'gender' is qualitative.
- ***Quantitative variables*** – are numerical in nature and can be ordered or ranked. For example, the variable 'age' is numerical and people can be ranked in order according to the value of their ages. They can be further classified into two groups, namely;
  - **Discrete and Continuous variables**

Discrete and Continuous Variables

- **Discrete variables** can be assigned values such as 0, 1, 2, 3 are said to be countable. Examples of discrete variables are the number of children in a family, the number of students in a class, the number of cars that pass through a check point, etc.
- **Continuous variables** can assume all values between any two specific values. Temperature for example, is a continuous variable, since the variable can assume all values between any two given temperatures. Other examples are; weights of individuals, lengths of items measured in cm, km, etc.

LEVELS OF MEASUREMENT

- Data are the facts and figures collected, analysed and summarized for presentation and interpretation. Data can be classified according to levels of measurement.
- Measurement is the process of mapping or assigning numbers to objects or observations. Measurement can be:
  - In common units like meters, cedis, naira, litres, grams or number of persons; or
  - Scores (values) assigned to objects quantities that represent a rating or evaluation.

LEVELS OF MEASUREMENT

- There are four basic levels of measurement, namely;
  - ***Nominal Level Data***
  - ***The Ordinal Level Data***
  - ***The Interval Scale***
  - ***The Ratio Scale***

NOMINAL LEVEL DATA

- In the nominal level of measurement, the observation can only be classified or counted. The nominal scale defines specific categories by name, number or symbol. Nominal scales indicate group membership. There is no particular order to the labels. The nominal scale is the weakest 'scale of measurement'.
- **Properties of Nominal Scale**
  - Data categories:
  - are mutually exclusive (an individual can belong to only one category)
  - have no logical order

NOMINAL LEVEL DATA

- Examples
  - Classification of six colours of candies could be brown, yellow, blue, orange, green and red.
  - Gender is another example of the nominal scale of measurement. Thus, counting men or women.
  - People may be categorized on the basis of ‘marital status’ (single, married, divorced, widowed, others)
  - The numbers on automobile license plates (e.g. GT 660 - 09)
  - Numbers on football jerseys, social security numbers, telephone numbers, etc.

ORDINAL LEVEL DATA

- An ordinal scale incorporates the features of a nominal scale and the additional feature that observations can be ordered or ranked from low to high. Synonym of ordinal scale is ‘ranking scale’. In ordinal scale only the comparisons, ‘greater than’, ‘less than’ or equal to are relevant. The equal to (=) relation holds among members of the same class.

ORDINAL LEVEL DATA

- Example;

Table below lists the student ratings of a finance professor.

Rating		Frequency
Superior	-	6
Good	-	28
Average	-	25
Poor	-	12
Inferior	-	3

ORDINAL LEVEL DATA

- **Examples;**
  - Students' knowledge in business statistics is classified according to levels: low, average, high.
  - The system of grades in the military service: Sergeant > Corporal > Private.
  - Grades A, B, C.
  - Judging (1st place, 2nd place, etc.)
- **Properties of Ordinal Scale**
  - Data categories are mutually exclusive (an individual can belong to only category)
  - Data categories have logical order
  - Data categories are scaled according to the amount of a particular characteristic that they possess.

THE INTERVAL SCALE

- An interval scale incorporates all features of an ordinal (and hence nominal) scale and the additional feature that *distance between levels on the scale can be specified*. Examples of interval level of measurement include:
- Temperature, i.e. the difference between temperatures 60^{o} and 70^{o} is the same as the difference between temperatures 20^{o} and 30^{o}. (Temperature is measured in centigrade (Celsius) or Fahrenheit);
- Intelligence Quotient (I.Q) The difference between IQ of 130 and 140 is the same as between 80 and 90;
- SAT Score.

THE INTERVAL SCALE

Properties of the interval scale

- Data categories are mutually exclusive
- Data categories have logical order
- Data categories are scaled according to the amount of a particular characteristic that they possess.
- The interval scale requires unit distance but it is not important which distance is defined to be the unit distance. For example, temperature is measured by both Fahrenheit and the centigrade scales, with different definitions of ‘one degree’ or unit.
- The interval scale requires a zero point but the zero point is completely **arbitrary**, that is we do not know where 0 is located. It is not important which measure is declared to be zero. Hence we do not have true zero.

THE RATIO SCALE

- The ratio scale is the highest level of measurement. The ratio level of measurement has all the characteristic of the interval, level, but in addition, the 0 point is meaningful and the ratio between two numbers is meaningful.
- Examples of the ratio scale of measurement include wages, units of production, weight and height.
- Money is a good illustration. If you have 0 Ghana cedis, then you have no money. Weight is another example. If the dial on the scale is at zero, then there is complete absence of weight. The ratio of two numbers is also meaningful. If Kobby earns GH¢60 million per year for selling cars and Budu earns GH¢30 million per year for selling batteries, then Kobby earns twice as much as Budu.

THE RATIO SCALE

- **Properties**
  - Data categories are mutually exclusive and exhaustive
  - Data categories have logical order
  - Data categories are scaled according to the amount of a particular characteristic they possess
  - Equal differences in the characteristic are represented by equal differences in the numbers assigned to the categories
  - The ratios of the values are meaningful
  - The zero point represents an absence of the characteristic being measured.

THE RATIO SCALE

Other examples of ratio scale are:

- Time;
- Salary;
- Age.

END OF SESSION

ANY QUESTIONS?