University of Dhaka

Institute of Business Administration (IBA)

Master of Business Administration (MBA)

K501: *Quantative Analysis for Business Decision*

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Statistics and Its Fundamental Concepts

21-04-25 Monday

Statistics is the science of collecting, organizing, analyzing, interpreting, and presenting data to support decision-making and problem-solving in business and other domains. It provides a quantitative foundation for managerial decisions by offering meaningful insights from data.

Types of Statistics:

1. **Descriptive Statistics:** This involves methods of organizing, summarizing, and displaying data.
    - Examples: Mean, Median, Mode, Standard Deviation, Frequency tables, Pie charts, Histograms.
    - Use Case: A retail manager summarizes last month's sales performance using a bar chart and average daily revenue.
2. **Inferential Statistics:** This refers to techniques for making generalizations from a sample to a population using probability theory.
    - Examples: Hypothesis testing, Confidence intervals, Regression analysis.
    - Use Case: A pharmaceutical company tests a new drug on a sample group to infer its effectiveness on the broader population.

Types of Variables:

- **Qualitative (Categorical) Variables:** Represent categories or labels.
    - Examples: Gender, Brand name, Type of customer (new/returning).
- **Quantitative Variables:** Represent numeric values.
    - **Discrete Variables:** Countable values (e.g., Number of employees).
    - **Continuous Variables:** Measurable and can take any value within a range (e.g., Sales revenue, Temperature).

Levels of Measurement:

Other Key Concepts:

- **Population:** The entire group of individuals or instances about whom we hope to learn.
- **Sample:** A subset of the population, selected for analysis.
- **Parameter:** A numerical summary or measure that describes a characteristic of a population (e.g., population mean μ).
- **Statistic:** A numerical summary derived from a sample (e.g., sample mean $\bar{x}$). Statistics are used to estimate parameters.

Characteristic	Nominal	Ordinal	Interval	Ratio
Definition	Categorical data without any order	Categorical data with a logical order	Numeric data with equal intervals, no true zero	Numeric data with equal intervals and a true zero
Nature of Data	Labels or names	Ordered categories	Quantitative	Quantitative
Mathematical Operations	Equality only	Comparisons (>, <)	Addition, subtraction	All mathematical operations
Meaningful Zero	No	No	No	Yes
Can Calculate Mean?	No	No (median preferred)	Yes	Yes
Examples	Gender, Blood Type, Product Type	Socioeconomic Status, Education Level	Temperature (Celsius/Fahrenheit), IQ Score	Height, Weight, Age, Sales Revenue
Applicable Statistics	Mode, Frequency	Mode, Median, Percentile	Mean, SD, Correlation	All descriptive and inferential statistics
Distance between values is meaningful?	No	Not always	Yes	Yes
Has absolute zero?	No	No	No	Yes

Table 1: Comparison of Levels of Measurement

Classification of Variables with Examples

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Table 2: Classification of Variables — Qualitative vs Quantitative, Discrete vs Continuous

Variable Type	Discrete Examples	Continuous Examples
Qualitative	Shirt size (S, M, L) Product category (A, B, C) Number of children category (None, One, Two+) Room type (Single, Double) Education level (High School, UG, PG)	Skin tone spectrum Customer feedback scale Dialect variation Shade of color preferences Accent variation
Quantitative	Number of cars owned Number of transactions Exam scores (out of 100) Number of employees Number of visits	Height (cm) Weight (kg) Income ($) Temperature (°C) Time spent (hours)

Table 2: Classification of Variables: Qualitative vs Quantitative and Discrete vs Continuous

Table 3: Classification by Levels of Measurement — Nominal, Ordinal, Interval, Ratio with Discrete and Continuous Types

Level of Measurement	**Discrete Examples**	**Continuous Examples**
Nominal	• Jersey number • Postal code • Nationality • Product ID • Car model	• Color shade • Accent pattern • Logo design variation • Pattern of speech • Ink density
Ordinal	• Customer rating (1–5 stars) • Survey rank (Strongly disagree to Agree) • Academic grade (A, B, C) • Job level (Junior, Mid, Senior) • Market tier (Low, Mid, High)	• Satisfaction level on 0–10 scale • Credit score bands • Health condition severity • Employee performance level • Risk tolerance scale
Interval	• Test scores (e.g., IQ, SAT) • Temperature recorded hourly • Credit scores in discrete brackets • Year of birth • Calendar dates	• Temperature (°C or °F) • Time of day (without AM/PM) • Financial index points • Sound intensity • Wind speed variation
Ratio	• Number of products sold • Number of goals scored • Number of books owned • Defect counts in production • Visitors per day	• Income • Distance traveled • Weight • Time • Age

Table 3: 50 Examples Categorized by Level of Measurement and Variable Type

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Wednesday

Topics Covered: