

STATISTICAL LABORATORY

Lecture 1: Fundamental Concepts of Statistics (Practice)

Yiu Lim LUI, Allen

Lisbon School of Economics & Management
Universidade de Lisboa

`allenlui@iseg.ulisboa.pt`

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Question 1.1

Distinguish the objectives of Descriptive Statistics from those of Inferential Statistics.

Suggested answer

- Descriptive statistics focus on summarizing observed data using tables, graphs, and calculations without drawing conclusions beyond the available sample,
- whereas inferential statistics extrapolate sample data to make reliable predictions or estimations about a broader population using probability theory, uncertainty, and hypothesis testing.

Question 1.2

What is the importance of sampling studies compared to census studies? Illustrate your answer with the underlying concepts.

Suggested answer

- Sampling studies are crucial because they are significantly more efficient, less costly, and less time-consuming than a full census, which covers every single unit in the target population but is often expensive, impractical, and difficult to manage.
- For example, surveying 1,000 households from a city represents a sampling study, whereas surveying every single household in an entire country constitutes a census.

Question 1.3

Distinguish between the concepts of statistic and parameter.

Suggested answer

- A population parameter is a fixed, generally unknown numerical value describing a characteristic of an entire population,
- whereas a sample statistic is a calculated value derived from a sample that functions as a random variable varying from sample to sample.

Question 1.4

Distinguish between cross-sectional data, time series data, and panel data, providing examples.

Suggested answer

- Cross-sectional data captures observations for multiple units at a single point in time,
- time series data records a single unit across equal time intervals,
- and panel data combines both approaches by tracking multiple units over a given time span.

Question 1.5

How can variables be classified according to the type of measurement scale? Provide examples.

Suggested answer

- Variables can be classified by their levels of measurement into nominal scales for unordered categories,
- ordinal scales for ordered categories, interval scales featuring ordered numbers with equal intervals but no absolute zero,
- and ratio scales that include a true absolute zero.

Question 1.6

How can variables be classified according to the number of values they can take? Provide examples.

Suggested answer

- Quantitative variables are separated by their value types into discrete numerical variables, which result from counting distinct or integer values,
- and continuous numerical variables, which result from measurement processes and can take any real number value along a continuum.