BIK31703 RESEARCH METHODOLOGY

DATA ANALYSIS (QUANTITATIVE)



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DATA ANALYSIS METHODS



DATA ANALYSIS

definition

Data analysis methods used in quantitative research involves the systematic and organised evaluation of numerical data to uncover patterns, relationships, and insights.

goal

The goal is to find patterns, draw valid inferences, and draw conclusions about the population or phenomenon being studied. These procedures often entail the analysis and interpretation of the data using statistical methodologies.

DATA ANALYSIS METHODS

FACTOR ANALYSIS

- Factor analysis is a statistical technique that helps us uncover the underlying factors or dimensions within a set of variables.
- It allows us to reduce the complexity of the data by identifying the commonalities and relationships among the variables.

TIME SERIES ANALYSIS

• Time series analysis examines data collected over time to find patterns, trends, and seasonal variations.

 It uses methods like moving averages, exponential smoothing, and ARIMA models to analyze and forecast future values based on past observations.

DATA ANALYSIS METHODS

CORRELATION ANALYSIS

- Correlation analysis looks at how variables are related.
- It measures the strength and direction of the relationship using correlation coefficients like pearson correlation and checks if the relationship is statistically significant.



- observations.
- similarities.

CLUSTER ANALYSIS

• Cluster analysis helps us organize data by finding groups of similar cases or

• It looks at the characteristics of each case and forms clusters based on their

• This technique allows us to identify patterns and segments within the data,

making it easier to understand and analyze complex information.

DATA ANALYSIS METHODS

REGRESSION ANALYSIS

- Regression analysis explores the connection between a dependent variable and independent variables.
- It reveals the relationship's strength, direction, and helps predict outcomes while accounting for other influential factors.

- 1. State your research hypothesis as a null

 - hypothesis (Ho) and alternate hypothesis (Ha or H1).
- 2. Collect data in a way designed to test the hypothesis.
- **3**. Perform an appropriate statistical test. 4. Decide whether to reject or fail to reject your null hypothesis.

- 5. Present the findings in your results and discussion section.

HYPOTHESIS ANALYSIS

5 main steps in hypothesis testing:

STATISTICAL ANALYSIS

definition

- The process of collecting, organizing, analyzing, interpreting, and presenting data
- To uncover patterns, relationships, and insights.
- Involves applying various statistical techniques to draw conclusions, make inferences, and support decision-making.



Descriptive Analysis



Inferential Analysis

DESCRIPTIVE & INFERENTIAL ANALYSIS



DESCRIPTIVE **ANALYSIS DEFINITION**

- Describe and present data.
- Aim to provide a clear understanding of the data.
- Descriptive statistics involves describing, summarising & organising the data so it can be easily understood Data such as measures of central tendency (mean, median, mode) & measures of dispersion (variance, standard deviation).

DESCRIPTIVE ANALYSIS PURPOSE

-Descriptive statistics serves as an essential initial step in the research process, providing a foundation for further analysis & interpretation.

- 1.Data Summarization summarize large amounts of data into concise and manageable forms
- 2.Data comparison compare different groups or subsets of data to draw meaningful conclusion
- 3.Data Presentation provides a way to visually present data to effectively convey the patterns in the data

EXAMPLE OF DESCRIPTIVE DATA

	A	В	С	D
1	Respondent Number	Age	Gender	Favorite Car Color
2	1	22	M	White
3	2	37	F	Silver
4	3	45	F	Black
5	4	62	F	Gray
6	5	28	M	Red
7	6	45	M	Green
8	7	88	F	Brown
9	8	61	M	White
10	9	95	M	Black
11	10	27	M	White
12	11	39	F	Green
13	12	43	M	Brown
14	13	55	F	Black
15	14	59	F	White

Blue 16%







Descriptive Statistics

INFRERENTIAL ANALYSIS DEFINITION AND PURPOSE

- Inferential statistics is a branch of statistics that involves drawing conclusions or making inferences about a population based on data collected from a sample.
- It aims to generalize findings from a smaller group (sample) to a larger population. The process involves analysing and interpreting data to make statements or predictions about the population parameters.

Web of Science Google Scholar No Preference Total Count

Researcher age and database preference

(Note: These data are Accoust

40 and Under	Over 40	Total
46	35	81
56.8%	43.2%	100%
35	45	80
43.8%	56.25%	100%
25	13	38
65.8%	34.2%	100%
106	93	199

ANALYSIS OF VARIANCE (ANOVA)

Definition

• Analysis of Variance (ANOVA) is a statistical technique used to analyze the differences between the means of two or more groups. It assesses the statistical significance of the variation between group means and the variation within groups.

Purpose

- To determine whether there are significant differences among the means of multiple groups. It allows researchers to compare the effects of different factors or treatments on a response variable and determine if any of these factors have a statistically significant impact.
- ANOVA breaks down the total variability in the data into two components: the variation between groups and the variation within groups. It then calculates an F-statistic, which is the ratio of between-group variability to within-group variability. If the ratio is sufficiently large and exceeds a critical value, it indicates that the group means are significantly different.
- ANOVA is commonly used in various fields, including experimental and social sciences, engineering, and business. It can be applied in situations where researchers want to compare means across different groups or levels of an independent variable and investigate the effects of multiple factors or treatments simultaneously.

TTEST

Definition

• A t-test is a statistical hypothesis test used to determine if there is a significant difference between the means of two groups or samples. It allows researchers to assess whether the observed difference between the means is likely to have occurred by chance or if it represents a true difference in the populations from which the groups were sampled.

Purpose

• The purpose of a t-test is to compare the means of two groups and determine if the observed difference is statistically significant. It helps researchers draw conclusions about whether the groups are truly different or if the observed difference is simply due to random variability.

30 ount 20 10 Gender Flavor





INFERENTIAL ANALYSIS

Definition

• Is a branch of statistics that involves making inferences or drawing conclusions about a population based on sample data. It uses statistical techniques to generalize and make predictions beyond the specific observations or data points that have been collected.

Purpose

• To make informed conclusions about populations based on limited sample data. It allows researchers to go beyond the specific sample they have and make broader statements about the larger population from which the sample was drawn. The goal is to estimate population parameters, test hypotheses, and quantify the level of uncertainty associated with the conclusions.

SAMPLING ERROR

Definition

• refers to the discrepancy or variation that arises between a sample statistic and the true population parameter it represents. It occurs due to the inherent randomness involved in selecting a sample from a larger population. In other words, sampling error is the difference between the characteristics or measurements observed in a sample and the true characteristics or measurements that would have been obtained if the entire population had been surveyed.

Purpose

• to acknowledge and account for the uncertainty that arises from using a sample to make inferences about a larger population. By recognizing and quantifying the potential error in our estimates, we can assest the reliability and accuracy of the conclusions drawn from the sample data.

STATISTICAL TEST

Definition

• refers to the discrepancy or variation that arises between a sample statistic and the true population parameter it represents. It occurs due to the inherent randomness involved in selecting a sample from a larger population. In other words, sampling error is the difference between the characteristics or measurements observed in a sample and the true characteristics or measurements that would have been obtained if the entire population had been surveyed.

Purpose

• to acknowledge and account for the uncertainty that arises from using a sample to make inferences about a larger population. By recognizing and quantifying the potential error in our estimates, we can assess the reliability and accuracy of the conclusions drawn from the sample data.

T-TEST

T-test is a statistical test used to determine if there is a significant difference between the means of two groups or populations.

Types of T - TEST a) Independent samples t-test: This type of t-test compares the means of two independent groups or samples to determine if there is a significant difference between them.

b) Paired samples t-test: This type of t-test compares the means of two related or paired groups.

T-TEST

1) NULL HYPOTHESIS AND ALTERNATIVE HYPOTHESIS 2) TEST STATISTICS (T-VALUE) 3) DEGREES OF FREEDOM **4) CRITICAL VALUE AND P-VALUE 5) INTERPRETATION**



ANOVA

Stands for Analysis of Variance, a statistical test used to analyse the difference between the means of more than two groups.

ANOVA assesses whether there are significant differences among the means of multiple groups and helps determine if those differences are due to chance or represent true variations.

ANOVA

1) NULL HYPOTHESIS AND ALTERNATIVE HYPOTHESIS 2) VARIABILITY 3) F - STATISTICS 4) DEGREES OF FREEDOM **5) CRITICAL VALUE AND P-VALUE** 6) POST-HOC TEST



RESEARCH ANALYSIS PROCEDURE



RESEARCH ANALYSIS PROCEDURE

1. PREPARING AND ORGANIZING DATA

- Gather the collected data from various sources, such as surveys, questionnaires, experiments, or existing datasets.
- Verify the accuracy and completeness of the data.
- Organize the data in a systematic and structured manner, ensuring it is ready for analysis.

No.	Items
1-	While teaching, order, request, lesson.
2-	While interactin such as: "Do yo
3- 4-	Teachers avoid they avoid usin Teachers are n
5-	about their abili interaction. Your teachers instance: "I am
6-	When planning regularly impos expressions: "w

Strongly Disagree Disagree Neutral Agree Strongly Agree

), teachers politely use to show commands, in a way like an , advice, or recommend to invite students to take part in the

ng, teachers provide help in conducting classroom activities ou need help?", "Can I give you a hand?" ...so forth.

d using unpleasant words with their students. That is to say; ng impolite expressions.

nodest with their students in a way that they avoid talking lities, possessions, and achievements during classroom

express their apologies in certain cases while interacting, for sorry...", "Excuse me please,", etc.

and ...so on, teachers politely and se or interfere to the classroom issues, such as using the what about...", "why not...".

RESEARCH ANALYSIS Procedure

2. DATA SCREENING AND CLEANING

- Conduct initial screening of the data to identify any errors, missing values, outliers, or inconsistencies.
- Clean the data by addressing any identified issues, such as correcting errors, imputing missing values, or removing outliers, as appropriate.
- Document the process of data screening and cleaning for transparency and reproducibility





RESEARCH ANALYSIS PROCEDURE

4. Descriptive Analysis:

- variable of interest.
- or asymmetry.

• Summarize the Data: Calculate measures of central tendency (e.g., mean, median, mode) and measures of dispersion (e.g., range, variance, standard deviation) for each • Examine Distributions: Create frequency distributions and histograms to visualize the data patterns and identify any skewness

RESEARCH ANALYSIS PROCEDURE

4. Inferential Analysis

- Apply appropriate inferential statistical techniques to analyse the data and draw conclusions about the population based on the collected sample.
- Select and perform statistical tests based on the research questions or hypotheses, such as t-tests, ANOVA, regression analysis, or regression analysis.



RESEARCH ANALYSIS PROCEDURE

- 5. Presentation and Reporting:
 - Summarize Findings: Present the key results of the analysis, including descriptive statistics, inferential test outcomes.
 - Visualize Data: Present the results in a clear and understandable manner using appropriate tables, graphs, or charts.
 - Provide sufficient details and references to ensure the research can be replicated or verified by others.
 - Limitations and Future Directions: Address the limitations of the study, such as sample size, sampling method, and potential biases. Identify areas for further research or investigation.

FREQUENCIES AND **TABLE 40.1** PERCENTAGES OF GENERAL STRESS LEVEL OF TEACHERS

Stress level	Frequency	Percent
1	13	2.6
2	15	3.0
3	39	7.8
4	43	8.6
5	69	13.8
6	73	14.6
7	109	21.8
8	104	20.8
9	25	5.0
10	10	2.0
Total	500	100.0

Example of result representation (table) in a quantitative research

