Identification of Appropriate Statistical Method

The purpose of this chapter is to identify the appropriate statistical method(s) for analyzing a specific type of data. The chapter consists largely of flow charts to guide the analyst through a series of questions, eventually directing the analyst to the correct statistical method.

Purpose of this chapter

To identify the appropriate statistical technique for a specific data analysis problem.

Basic Assumptions/Requirements of this chapter

1) The analyst has designed a research study, identified data needs, and developed statistical hypothesis in which to test,

2) The analyst can answer questions about the types of variables, both dependent and independent, collected in the study, and

3) The analyst knows the analysis objective: e.g. modeling, comparison of distributions, test of independence of variables, comparison of distributions parameters, graphical methods, etc.

4) The analyst must have access to statistical computer software, such that some of the questions regarding data can be answered using graphical methods.

Methodology

The methodology for identifying the appropriate statistical method is as follows. Identify the first single analytical task that must be performed with the data, and then proceed through the flowcharts. Use flowcharts 1 through 4 on the following pages to provide direction to the appropriate chapter and section in the manual. Always begin with flowchart 1, which will lead directly to one of the other flowcharts (2 through 4), which then leads to a technical section in the manual for use in applying the statistical method of choice. Use the flowchart for each analytical task needed for the research.
Flow Chart 1: Select Purpose of Research and Measurement Scale of Data

Graphical Methods, Description of Data, Compare means and medians, Measures of association, Tests of independence, Goodness of fit comparisons (nominal or ordinal scale data, or ratio/interval data without distributional assumptions)

YES

Goto Flow Chart 2:

NO

Compare means from one or more groups (ratio/interval data with normal distribution assumption)

YES

Goto Chapter IV, Section A:

NO

Modeling for prediction, explanation, or quality control: Is the dependent variable ratio/interval?

NO

Goto Flow Chart 3:

YES

Goto Flow Chart 4:
Flow Chart 2: Select Intent of Analysis
(Assumption is data are of nominal or ordinal scale, or interval/ratio scale with unknown distributional properties)

- Graphing Data, Scatter Plots, 3-D Plots, Surface Plots
  - YES: Goto Flow Chapter VI, Section B:
  - NO:
    - Compute means and variances, histograms, box plots
      - YES: Goto Flow Chapter VI, Section C:
      - NO:
        - Compare population medians and means
          - YES: Goto Flow Chapter VI, Section D:
          - NO:
            - Measures of association (correlation), and tests for independence between variables
              - YES: Goto Flow Chapter VI, Section E:
              - NO:
                - Goodness of fit comparisons: two empirical distribution functions (EDF's), one EDF and a theoretical distribution
                  - YES: Goto Flow Chapter VI, Section F:
Flow Chart 3: Discrete (nominal/ordinal) Dependent Variable Models

Is the dependent variable nominal, representing a choice set or classification?

Yes → Goto Chapter V: Section A

No →

Is the dependent variable count data, e.g. number of events in a specific time period?

Yes → Goto Chapter V: Section B

No → The dependent variable is binary, "yes" or "no", or grouped in binominal proportions (e.g. %agree, %disagree) → Goto Chapter V: Section C
Flow Chart 4: Continuous (interval/ratio) Dependent Variable Models

Are the independent variables discrete?

Are the data observed across evenly spaced increments of time?

Are the data time-to-event? (i.e. time until malfunction)

Is the dependent variable normally distributed?

Is the dependent variable any of the following: Non-normally distributed, Constrained in response, or proportions data?

Goto Chapter IV: Section A

Goto Chapter VI: Section E

Goto Chapter IV: Section C

Goto Chapter IV: Section C

Goto Chapter IV: Section B

Goto Chapter V: Section C
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