Quantitative Analysis for Social Sciences (Political Science Statistics Lab)

Outline of topics on course syllabus (Spring 2023, Rice University)

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Introduction

- What R/R studio are
- How does it look like, layout, functionalities, etc.

Fundamentals

- Syntax/coding; printing; commenting; help() function
- Packages, functions, objects
- Variables and data types
- R math, Booleans, operators
- R strings
- If…else and loops; pseudo code
- R data structures

R data

- 'built-in' data
- Data packages
- Creating data
- Bringing in data

Data cleansing and visualization I

- Renaming
- Recoding
- New Variables (Data Transformation)
- New Variables (Data Creation)
- Frequencies, Tables, Cross tabs
- Basic Scatter Plots, Barplot, Histogram

Measures of Central Tendency and Dispersion

- Central tendency: mean, median, mode
- Dispersion/variability: range, upper and lower quartiles, interquartile range, variance, standard deviation
- Z-score

Data Summarization

- Built in measures to have a glimpse of data in terms of MCT&D
- Summarize data by groups

Data Visualization II

- Histogram with mean and other values
- Density plot with mean and SD
- Boxplot (knowing and plotting what measure each part of it represents)
- Summary based on groups

Measures of association I (actually Hypothesis testing)

- Z- and t-tests; one-sample, two-sample
- Paired/dependent vs unpaired/independent t-test

Data visualization III

- Hypothesis testing
    - One- and two-sample t-test density plots
    - Paired data before and after treatment
- Multivariate graphs:
    - 2 & 3 variable scatter plots and line plots
    - Grouped kernel density plots
    - Box and violin plots by group
    - Mean/SEM plots

Measures of association II (effect sizes and association)

- Cohen's d
- ANOVA (1-way, 2-way)
- F-statistic
- Eta squared
- Odds ratio
- Chi-squared
- Correlation, Pearson's r

Data visualization IV

- Cohen's: normalized distribution density plots with group means and difference
- ANOVA: assumptions testing; results visualization
- Odds ratio plot
- Correlograms

Regression

- Lineal regression

- Logistic regression
- Bivariate/multivariate regression
    - Transformations, interactions