Tutorial 03, Michaelmas Term

Research Methods for Political Science (PO3600)

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Paper Assignment 1

Paper Assignment 1 (Research Proposal)

Students taking the entire module

- Research proposal; Friday 15 December 2017
- Research paper based on the proposal (10%); 15 December 2017
- Assignment is **in pairs**

One Term Students

- Research proposal (30%); 24 November 2017
- Research paper based on the proposal (50%); 15 December 2017
- Assignment is **individual**

Contents of the Research Proposal

1. Introduction: Explanatory (!) research question, relevance (200 words)
2. Short discussion of the literature and outline of theoretical argument (400 words)
3. Design of the study, including type of data; operationalisation (valid and reliable!); datasets; control variables (400 words)
4. How could/would you analyse your data; if statistical analysis, what type of analysis is necessary? (200 words)
5. Indicate how each of you has contributed

One-Term students

The following is only relevant for one-term students!

- Statistics training will be more limited, but possible to study bivariate relationships using contingency tables, chi square, phi, correlations, t-tests, proportion tests
- Take limitations in terms of statistical analysis into account when deciding about research question and design

Important Things to Consider

1. Answer question based on existing data
2. Be creative and insightful
3. Write an empirical study, not a literature study
4. Word count is low, so be concise
5. Questions? Thomas Chadefaux has office hours
6. Detailed instructions are on Blackboard

Recap

1. Mean: $\bar{x} = \frac{\sum x}{n}$
2. Standard deviation: $\sigma = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}}$
3. Standard error of the mean: $sd(\bar{X}) = \frac{\sigma}{\sqrt{n}}$
4. 95 % confidence interval: $CI = \bar{x} \pm 1.96 * sd(\bar{X})$

Confidence intervals

For a given statistic calculated from a sample, the confidence interval is a range of values around that statistic that are believed to contain, with a certain probability, the true value of that statistic (population value).

A 95% confidence interval will contain the population mean 19 out of 20 times.

Calculate confidence intervals

Sample mean ($\bar{x}$): 170(cm)

Sample standard deviation (σ): 10

Sample size (n): 30

Standard error of the mean ($sd(\bar{X})$)

Task: Estimate the 95 % confidence intervals

$$\text{Standard error} = sd(\bar{X}) = \frac{\sigma}{\sqrt{n}} = \frac{15}{\sqrt{30}} = 2.74$$

$$CI = 170 \pm 1.96 * 2.74$$

$$CI_{low} = 170 - 1.96 * 2.74 = 164.6$$

$$CI_{high} = 170 + 1.96 * 2.7 = 175.4$$

The History of the t-test

https://www.youtube.com/watch?v=U9Wr7VEPGXA

One-sample t-test (I)

IQ in general population is 100. We take a random sample of 30 high school students and find $\bar{x} = 110$, $\sigma = 10$.

H_0: The observed average IQ equals the general population's IQ.

H_1: The observed average IQ differs from the general population IQ.

Selecting sampling distribution and critical region: Population standard deviation (σ) is unknown: t-distribution with $n - 1$ degrees of freedom ($n = 30, df = 29$). $\alpha = 0.05$

One-sample t-test (II)

Calculate test-statistic: $t = \frac{observed\ \ value - expected\ \ value\ \ under\ \ H_0}{standard\ \ error}$

$$t = \frac{X - \mu}{\frac{\sigma}{\sqrt{n}}}$$

$$t = \frac{110 - 100}{\frac{10}{\sqrt{30}}}$$

$$t = 5.47$$

t-test for two independent samples

H_0: No difference between groups.

H_1: Difference between groups.

$$t = \frac{\bar{x_1} - \bar{x_2}}{\sqrt{(\sigma^2/n_1) + (\sigma^2/n_2)}}$$

See extensively: http://www.moderndive.com, chapter 8.7

Paired samples t-test based on simulated rents

https://tinyurl.com/RentDublinData

1. Download and load `csv` data (simulated rent prices)
2. Relabel `area`: 1 = North Dublin; 2 = South Dublin
3. Conduct independent samples t-test
4. Filter only South Dublin; observed value of 400; conduct one-sample t-test