

# **Tutorial 03, Michaelmas Term**

Research Methods for Political Science (PO3600)

---

Stefan Müller

24 October 2017

Trinity College Dublin

<http://muellerstefan.net/research-methods>

## 1. Paper Assignment 1

# Paper Assignment 1

---

## 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

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 Chadeaux has office hours
6. Detailed instructions are on Blackboard

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:  $CI = \bar{x} \pm 1.96 * sd(\bar{X})$



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 ( $\sigma$ ): 10

Sample size ( $n$ ): 30

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

**Task:** Estimate the 95 % confidence intervals

$$\text{Standard error} = sd(\bar{X}) = \frac{\sigma}{\sqrt{n}} = \frac{10}{\sqrt{30}} = 1.82$$

$$CI = 170 \pm 1.96 * 1.83$$

$$CI_{low} = 170 - 1.96 * 1.83 = 166.41$$

$$CI_{high} = 170 + 1.96 * 1.83 = 173.58$$

# 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 ( $\sigma$ ) 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:  $t = \frac{\text{observed value} - \text{expected value under } H_0}{\text{standard error}}$

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

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

$$t = 5.47$$

$H_0$ : 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

Download [www.muellerstefan.net/data/mt03.sav](http://www.muellerstefan.net/data/mt03.sav)

1. Download and load csv data (simulated rent prices)
2. area: North Dublin; South Dublin; price: simulated price
3. Observed value of 400; conduct one-sample t-test (for entire sample)
4. Conduct independent samples t-test (compare means of South and North Dublin)