Course content

Political scientists often pose questions of the type “Does X have an effect on Y?” Key to finding an answer is the formulation of a counter-factual: “What would Y have looked like in the absence of X?” The most significant challenge we face when trying to answer such questions with empirical data is that pre-existing conditions may affect both the explanatory factors and the outcomes we are interested in. This course examines ways to overcome this challenge by carefully selecting an appropriate research design and a suitable statistical model. The course aims to provide a toolkit of quantitative techniques for students interested in studying social science with observational data.

The first part of the course centers on experimental and quasi-experimental research designs. We discuss how *randomization* reduces concerns about pre-existing conditions and help us estimate causal effects making fewer assumptions. We then turn to experimental designs and empirical approaches based on an *as if random* assumption, such as regression discontinuity designs.

The second part of the course focuses on statistical modeling, which is also crucial for successful causal inference. We start by introducing Bayesian inference and how it differs from frequentist inference. We then discuss how to fit and evaluate models in a Bayesian framework, and how to specify an appropriate model for different types of data.

Students will get hands-on practice by learning how to implement the various techniques and by replicating existing studies in R. Students will also learn how to present results in a manner that is understandable to a general audience, for example by using graphs and other visual tools.

Learning outcome

**Knowledge**

Students will:

* understand the basics of Bayesian inference and how it differs from frequentist inference
* understand the value of randomization and *as if*random research designs in identifying causal effects
* become familiar with different types of data structures and types of outcome variables, including continuous, categorical, and ordered outcomes
* be aware of key probability distributions and how they can serve as link functions in generalized linear models
* understand the concepts of shrinkage and overfitting

**Skills**

Students will know how to:

* fit models in R using frequentist and Bayesian inference
* employ key research designs for drawing causal inferences based on observational data
* select a suitable link function for different types of outcome data
* use simulation as a tool to evaluate the appropriateness of a model
* compare models with a view to avoid under- and overfitting
* replicate statistical studies and write their own scripts using R
* effectively present statistical material in tables and figures

**Competences**

Students have:

* the ability to critically evaluate empirical research designs intended to identify causal effects
* the ability to evaluate the appropriateness of a statistical model for a given dataset
* experience analyzing and visualizing a broad range of quantitative observational data using the programming language R

Admission

Students who are admitted to study programmes at UiO must each semester [register which courses and exams they wish to sign up for](http://www.uio.no/english/studies/registrations/course-registration/) in Studentweb.

Students enrolled in other Master's Degree Programmes can, on application, be admitted to the course if this is cleared by their own study programme.

If you are not already enrolled as a student at UiO, please see our information about [admission requirements and procedures](http://www.uio.no/english/studies/admission/).

 [Apply for guest student status](http://www.sv.uio.no/english/studies/admin/guest-student/isv.html)if you are admitted to another Master's programme.

Prerequisites

Formal prerequisite knowledge

[STV4020A – Forskningsmetode og statistikk](https://www.uio.no/studier/emner/sv/statsvitenskap/STV4020A/index.html) or courses with equivalent learning outcomes. Students are expected to have working knowledge of R, which should cover at least: loading data and packages, data recoding, fitting at least simple regression models, and extracting quantities of interest from these model objects.

Overlapping courses

6 credits overlap with [STV4025 – Quantitative political science (discontinued)](https://www.uio.no/studier/emner/sv/statsvitenskap/STV4025/index.html)

Teaching

Lectures and seminars.

***Students are required to bring own laptop to lectures and seminars.***

Examination

Home exam which includes five subtasks.

* Each subtask must be between 800-1000 words.

Language of examination

You can submit your response in English or Norwegian.

Grading scale

Grades are awarded on a scale from A to F, where A is the best grade and F is a fail. Read more about [the grading system](http://www.uio.no/english/studies/examinations/grading-system/).

Explanations and appeals

* [Explanation of grades and appeals](http://www.uio.no/english/studies/examinations/explanation-appeal/)

Resit an examination

If you are sick or have another valid reason for not attending the regular exam, we offer a [postponed exam](http://www.uio.no/english/studies/examinations/illness-postponed/) later in the same semester.

See also our information about [resitting an exam](http://www.uio.no/english/studies/examinations/new-exam/).

Withdrawal from an examination

It is possible to take the exam up to 3 times. If you [withdraw from the exam](http://www.uio.no/english/studies/examinations/withdrawal/) after the deadline or during the exam, this will be counted as an examination attempt.

Special examination arrangements

Application form, deadline and requirements for [special examination arrangements](http://www.uio.no/english/studies/examinations/special-arrangements/).

Evaluation

The course is subject to continuous evaluation. At regular intervals we also ask students to participate in a more comprehensive evaluation.