Workshop Syllabus: Modern Causal Inference Methods in R

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Duration: 3 Hours

Date and time: 3rd April 2024, 10.00am to 13.00pm

Course Description

The field of quantitative research has significantly evolved, transitioning from classical regression models to an emphasis on causal interpretation through experimental and quasi-experimental methods. This workshop introduces participants to advanced causal inference methods, emphasizing the credibility revolution in empirical economics. Participants will learn about potential outcome models, direct acyclic graphs, difference-in-difference, synthetic control methods, and the innovative staggered difference in difference and synthetic difference-in-difference approaches. Practical demonstrations in R will accompany the theoretical discussions, with examples including the impacts of trade agreements and Brexit on trade flows.

Workshop Objectives

- Understand the transition from classical regression to modern causal inference methods.
- Learn to apply potential outcome models and direct acyclic graphs for causal analysis.
- Gain insights into recent developments in difference-in-difference and synthetic control methods.
- Explore the application of staggered difference-in-differences and synthetic difference-in-difference.
- Practical experience with R to implement these methods in real-world scenarios.

Requirements

- Participants are required to bring a laptop with R and RStudio installed.
- Prior knowledge of basic statistics and familiarity with R programming is recommended.

Schedule

Session 1: Introduction to Causal Inference (45 minutes) - Potential outcome model
- Direct acyclic graphs - Getting started with R: Setting up the environment

Session 2: Difference-in-Difference and Synthetic Control Methods (45 minutes) -
Deep dive into difference-in-difference methods. - Introduction to synthetic control method -
Practical demonstration in R: Analyzing policy impacts: Brexit and trade agreements

Break: 15 minutes

**Session 3: Staggered Difference-in-Differences and Synthetic Difference-in-
Difference (1 hour)** - Exploring staggered policy implementations and heterogeneous
impacts. - Introduction to synthetic difference-in-difference. - Practical demonstration in R:
continuing evaluating the impacts of preferential trade agreements and Brexit.

Session 4: Practical Application and Q&A (15 minutes) - Open Q&A session.

Reading Materials

- Angrist, J. D., & Pischke, J. S. (2008). Mostly harmless econometrics: An empiricist's
  companion. Princeton University Press.
- Scott Cunningham's "Causal Inference: The Mixtape." link
- Nick Huntington-Klein's "The Effect: An Introduction to Research Design and Causal-
  ity." link

Additional Notes

- Participants are encouraged to review the provided reading materials before attending
  the workshop.
- Practical sessions will require the use of R; familiarity with the software is beneficial but
  not mandatory.

  – Qick R tutorial: link

Installing R and RStudio

This guide provides instructions on how to install R and RStudio on your computer. R is a
free software environment for statistical computing and graphics, and RStudio is an integrated
development environment (IDE) for R. Installing both is straightforward. Follow these steps
to get started:

Step 1: Install R

For Windows/macOS Users:

1. Visit the Comprehensive R Archive Network (CRAN) website at CRAN R-project and choose one of the website from the list. It really not that important which one you choose, but it is recommended to choose the one that is closest to your location.
2. Choose the appropriate download link for your operating system (Windows or macOS). Click on base and then download the installer
3. Run the downloaded file and follow the installation instructions.
4. Install Rtools by clicking on the link provided in the installation instructions.

Step 2: Install RStudio

1. Visit the RStudio download page at RStudio Download.
2. Under **RStudio Desktop**, click on **Download RStudio Desktop**.
3. Scroll down to the **Installers for Supported Platforms** section.
4. Download the installer appropriate for your operating system (Windows, macOS, or Linux).
5. Run the downloaded file and follow the installation instructions.

Step 3: Verify Installation

- **For R:**
  - Open R by searching for it in your applications or by using the terminal (for Linux users).
  - You should see the R console. This indicates that R is successfully installed.

- **For RStudio:**
  - Open RStudio by searching for it in your applications.
  - If you see the RStudio interface with the Console, Environment, History, and Files/Plots/Packages/Help tabs, RStudio is successfully installed.

Congratulations! You are now ready to start using R and RStudio for your statistical computing needs.

Additional Notes:

- Make sure to keep R and RStudio updated to the latest version to access new features and ensure compatibility.
- R packages can be installed using the `install.packages()` function in RStudio. We will be using several packages during the workshop.
- If you encounter any issues during installation, refer to the official documentation or community forums for assistance.