CORSO: <u>Econometric methods for policy evaluation</u>

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DESCRIZIONE DEL CORSO

One of the central applications of economics is the evaluation of policies and interventions. Causality is important in econometrics because it enables economists to go beyond mere correlations, providing a deeper understanding of how economic variables interact and influence each other. This understanding is essential for making sound economic decisions, designing effective policies, and advancing economic theory. For example, it helps determine whether an increase in the minimum wage directly leads to changes in employment levels. This course delves into advanced topics in causal inference, particularly focusing on 'irregular design' and observation studies. Irregular designs represent complex scenarios where the standard assumptions required for estimating causal effects do not apply. Examples of irregular designs include randomized experiments affected by non-compliance, as well as observational studies with unmeasured confounding variables. Additionally, we explore other challenging irregular designs, such as regression discontinuity designs, where treatment assignment relies on specific thresholds, leading to issues of overlap and other methods for panel data with parallel trends or similar assumptions. In the course's second segment, our exploration extends to the realm of spillover effects. Here, we transcend the common assumption of independence between units and investigate how the treatment of one unit may reverberate onto the outcomes of others. We introduce cutting-edge statistical methodologies tailored for estimating spillover or peer-influence effects, particularly within clusters of units or social networks.

OBIETTIVI DI APPRENDIMENTO

- Gain a comprehensive understanding of econometric methodologies used in policy evaluation.
- Learn how to define, identify, and estimate causal estimands in the context of policy evaluation.
- Explore the connections between econometrics and causal inference in statistics and understand how these concepts relate to one another.
- Apply the learned methodologies to assess and evaluate well-known policy programs effectively.
- Develop practical skills in using the R software for econometric analysis and policy evaluation tasks.
- Discuss the latest advancements in causal inference.

METODOLOGIA

Classroom Lectures, practices, and applications with R.

VALUTAZIONE

Research projects: The project offers flexibility in its structure and can be undertaken individually (by a single student) or collaboratively with colleagues. This project allows for

diverse approaches, including conducting empirical applications of causal methodologies discussed in the course using real-world datasets, conducting simulation studies that compare various alternative causal inference methods, or even proposing innovative methodological concepts. Alternatively, although less preferred, students may choose to compile a report focused on a selection of papers related to the course material or those extending topics introduced during the class. The assessment of the project's quality will consider the originality of intellectual contributions and the excellence of written presentation. Students are strongly encouraged to engage in ongoing discussions with the instructor throughout the semester to refine their project ideas.

PROGRAMMA

Introduction

· Potential Outcomes Framework
· Fisher's Randomization Tests
· Permutation Tests for Cluster Randomized Experiments
· Fisher Randomization Tests for Multiple Outcomes
· Neyman Estimator for Completely Randomized Experiments
· Horvitz-Thomson Estimator
· Imputation-Based Estimation
· Stratification and Regression adjustment
· Observational studies and Unconfoundedness

Instrumental Variable, Treatment Endogeneity, and other irregular designs

· Treatment non-compliance
· Methods of Moments and Likelihood-based Inference
· Instrumental Variable in Observational Studies for Treatment Endogeneity
· Regression Discontinuity Deign
· Difference-in-Differences

Spillovers and Interference: Randomized Experiments and Observational Studies

· Definition of Interference and Spillover Effects
· Causal Estimands under Partial and Network Interference
· Two-Stage Randomized Experiments
· IPW and Randomization-based Estimators for Randomized Experiments
· IPW Estimator in Observational Studies

LIBRI DI TESTO

- Imbens, G. W., & Rubin, D. B. (2015). Causal inference in statistics, social, and biomedical sciences. Cambridge University Press.
Web page: https://www.cambridge.org/core/books/causal-inference-for-statistics-social-and-biomedical-sciences/71126BE90C58F1A431FE9B2DD07938AB
- Ding, P. (2023). A First Course in Causal Inference. arXiv preprint arXiv:2305.18793.
Web page: https://arxiv.org/abs/2305.18793

- Cattaneo, M. D., Idrobo, N., & Titiunik, R. (2023). A Practical Introduction to Regression Discontinuity Designs: Extensions. ArXiv. /abs/2301.0895
- Roth, J., Sant'Anna, P. H., Bilinski, A., & Poe, J. (2023). What's trending in difference-in-differences? A synthesis of the recent econometrics literature. Journal of Econometrics.
- Hudgens, M. G., & Halloran, M. E. (2008). Toward causal inference with interference. Journal of the American Statistical Association, 103(482), 832-842.
- Aronow, P. M., & Samii, C. (2017). Estimating average causal effects under general interference, with application to a social network experiment.
- Forastiere, L., Airoldi, E. M., & Mealli, F. (2021). Identification and estimation of treatment and interference effects in observational studies on networks. Journal of the American Statistical Association, 116(534), 901-918.
- Vazquez-Bare, G. (2022). Identification and estimation of spillover effects in randomized experiments. Journal of Econometrics.

LETTURE SUGGERITE

- Hernán MA, Robins JM (2020). Causal Inference: What If. Boca Raton: Chapman & Hall/CRC
Web page: https://www.hsph.harvard.edu/miguel-hernan/causal-inference-book/
- DiTraglia, Lecture Notes on Treatment Effects (or Completely Innocuous Econometrics)
Web page: https://www.treatment-effects.com/treatment-effects.pdf