COURSE UNIT (MODULE) DESCRIPTION

Subject	Science Category	Faculty
Applied Econometrics	Economics S 004	Faculty of Economics and Business Administration

Number of ECTS credits allocated	Student's workload (total)	Contact hours	Individual work
5	200	36	164

Academic staff
Coordinator: Dr. Povilas Lastauskas (https://orcid.org/0000-0001- 6053-5443) **Others:** Dr. Paul Hünermund (https://orcid.org/0000-0001-9163-038X) Dr. Algirdas Bartkus (https://orcid.org/0000-0002-6115-3823) Dr. Swapnil Singh (https://orcid.org/0000-0002-8046-2111)

Annotation

The objective of this course is to equip doctoral students with tools of empirical research. In doing so, the course is divided into two main parts: (1) micro-econometrics, and (2) macro-econometrics. We do not intend to go into mathematical details of methods more than necessary. Instead, our objective is to get you up to speed with different methods floating in this literature, which you can apply in your own research.

Course Outline

Part A: Topics in Applied Microeconometrics

1. Causality
   - (a) Potential Outcomes
   - (b) Endogeneity
   - (c) Directed acyclic graphs
   - (d) Selection bias
   - (e) Research Design
   - (f) Randomization
2. Quasi-experimental methods
   - (a) Matching
   - (b) Instrumental variables
   - (c) Difference-in-differences
     - i. Synthetic control
     - ii. Synthetic difference-in-differences
     - iii. Event studies
   - (d) Regression discontinuity

Part B: Topics in Applied Macroeconometrics

1. Time series - Univariate
   - (a) Time series data, Data Transformations, Seasonality
   - (b) Autocorrelation, Stationarity, Types of trends
   - (c) Autoregressive models, Moving averages, Forecasting
2. Time series - Multivariate
   - (a) Granger causality, Vector Autoregressions (VARs)
   - (b) Structural VAR, recursive identification (zero restrictions)
   - (c) Interpreting results: IRFs, FEVD, historical decomposition
   - (d) Additional identification methods (time permitting): sign restrictions, long-run restrictions, heteroskedasticity

Part C: Topics in Panel Data Econometrics

1. Introduction to panel data analysis: Data structures, Types of panel data, Variation types, Omitted variables problem
2. Estimation of panel models, Estimator properties, Types of effects
3. Tests for choosing the model, Panel model diagnostic tests
4. Dynamic panel models
5. Panel data modeling process

Learning outcomes: Upon successful completion of this course, students will demonstrate a comprehensive understanding of empirical research methods in economics, encompassing both microeconometrics and macroeconometrics. Students will be equipped to critically evaluate causal relationships using concepts such as potential outcomes and directed acyclic graphs, and to apply quasi-experimental methods including matching, instrumental variables, difference-in-differences, and regression discontinuity. They will gain proficiency in analyzing univariate and multivariate time series data, employing techniques such as autoregressive models and vector autoregressions (VARs). The course will enable students to interpret and communicate results from complex econometric analyses, including impulse response functions and forecast error variance decompositions. Importantly, students will develop the ability to design and implement empirical research strategies that appropriately address issues of causality, identification, and statistical inference in both microeconomic and macroeconomic contexts. By the end of the course, students will be prepared to critically assess and contribute to the current literature in applied econometrics, demonstrating an understanding of advanced topics such as synthetic control methods and various VAR identification strategies. Ultimately, students will cultivate the skills necessary to independently conduct rigorous empirical research suitable for doctoral-level work in economics.

Prerequisites

• Students who plan to take this course must have passed the Research Methods course and Statistics and Mathematics for Economists course that are typically offered in the fall semester.

Evaluation

The weights below are suggestive and it is up to the instructor to decide the exact weights.

• **Take-home assignments (40%).** There will be at least four assignments in this class.

• **Term paper (60%).**

Required reading

Main References

We will use these books during the course, but most of the material will be covered through lecture slides and notes.

For micro-econometrics:

1. Joshua Angrist and J¨orn-Steffen Pischke, Mostly Harmless Econometrics
2. Scott Cunningham, Causal Inference: The Mixtape, https://mixtape.scunning.com/
3. Jeffrey Woolridge, Introductory Econometrics: A Modern Approach

For macro-econometrics:

1. Stock, J. H. and Watson, M. W. Introduction to Econometrics. Boston: Pearson/Addison Wesley, 2007
2. Lu¨tkepohl, Helmut and Kr¨atzig, Markus. Applied Time Series Econometrics. Cambridge Uni- versity Press, 2004
3. Kilian, Lutz, and Helmut Lu¨tkepohl. Structural vector autoregressive analysis. Cambridge Uni- versity Press, 2017.
4. Brockwell, Peter J. and Richard A. Davis, Introduction to time series and forecasting. New York, NY: Springer New York, 2002.
5. Canova, Fabio. Methods for applied macroeconomic research. Vol. 13. Princeton university press, 2007.

Papers – Microeconometrics:

1. Lewbel (2019) “The Identification Zoo: Meanings of Identification in Econometrics”
2. Deaton (2010) “Instruments, Randomization, and Learning about Development”
3. Dehijia and Wahba (2002) “Propensity Score-Matching Methods for Nonexperimental

Causal Studies"
4. Smith and Todd (2005) "Does matching overcome LaLonde's critique of nonexperimental esti- mators?"
5. Dehijia (2005) "Practical propensity score matching: a reply to Smith and Todd"
6. Abadie et al. (2022) "When Should You Adjust Standard Errors for Clustering?"
7. Koenker (2017) "Quantile Regression: 40 Years On"
8.Train (2009) "Discrete Choice Methods with Simulation" https://eml.berkeley.edu/books/choice2. html
9. Abadie (2005) "Semiparametric difference-in-differences estimators"
10. Imai and Kim (2020) "On the Use of Two-Way Fixed Effects Regression Models for Causal Inference with Panel Data"
11. de Chaisemartin and d'Haultfoeuille (2018) "Fuzzy differences-in-differences"
12. Abadie (2019) "Using synthetic controls: Feasibility, data requirements, and methodological as- pects"
13. Abadie, Diamond and Hainmueller (2010) "Synthetic control methods for comparative case studies: Estimating the effect of California's tobacco control program"
14.Arkhangelsky et al. (2019) "Synthetic Difference In Differences"

Papers - Macroeconometrics:
1. Sims, Christopher A. (1980) "Macroeconomics and reality." Econometrica: 1-48.
2. Stock, James H., and Mark W. Watson. (2001) "Vector autoregressions." Journal of Economic perspectives 15.4: 101-115.
3. Blanchard, O. J. and Quah, D. (1989). "The dynamic effects of aggregate demand and supply disturbances". American Economic Review, 79, 655–673.
4. Uhlig, Harald (2005). "What are the effects of monetary policy on output? Results from an agnostic identification procedure." Journal of Monetary Economics 52.2: 381-419.
Course Policy