

MODULE SPECIFICATION

Module Title	Empirical Economics II
Module Code	ECO 436
Credits	5
Pre-requisites	Principles of Microeconomics, Principles of Macroeconomics, Empirical Economics I, and Introduction to Statistics

Description

Course Overview
<p>This course is the second course in an introductory sequence in econometrics and applied empirical analysis. The course examines how economists use data and statistical methods to investigate real-world questions about behavior, policy, and social outcomes. Examples may include questions about education, labor markets, household decision-making, inequality, family structure, and other economic and social phenomena.</p> <p>The course emphasizes the use of econometric reasoning to move from raw data to evidence-based conclusions. Students will learn how to formulate empirical questions, translate those questions into testable hypotheses, and evaluate the extent to which statistical relationships may support causal interpretations. Particular attention is given to the practical use of econometric tools, the assumptions behind those tools, and the interpretation of results in professional and academic settings.</p> <p>Topics include simple and multiple regression analysis, statistical inference, model specification, functional form, heteroskedasticity, autocorrelation, and introductory panel data methods. Students will also gain experience working with statistical software and applying empirical methods to a research project of their own. The course is designed both to strengthen quantitative reasoning and to provide a foundation for more advanced coursework in economics and related fields.</p>
<p>Learning Outcomes</p> <p>Upon successful completion of the course, students will be able to:</p> <ul style="list-style-type: none"> • estimate and interpret simple and multiple linear regression models; • conduct hypothesis tests and interpret statistical significance appropriately; • assess issues related to omitted variables, model specification, and measurement choices;

- recognize and respond to common violations of classical regression assumptions;
- apply econometric methods to cross-sectional and time-series style questions at an introductory level;
- use STATA to clean data, run regressions, generate output, and support empirical arguments;
- design and carry out a small-scale empirical research project using data-driven evidence.

Method of Teaching and Learning

The course combines lecture, guided discussion, applied software work, and problem-solving practice. Because econometrics is best learned through repeated application, class meetings are designed not only to introduce concepts but also to give students practice interpreting output, evaluating assumptions, and connecting methods to real economic questions. Regular STATA sessions form an important applied component of the class. These meetings reinforce lecture material through coding demonstrations, software review, and additional practice problems.

Syllabus

Modules

Module 1: Introduction to the Course

- Overview of course goals, expectations, and empirical reasoning
- The role of econometrics in economic analysis
- Types of economic data and the logic of empirical investigation
- Review of causal questions in economics and the limits of observational data

Module 2: Foundations Review and Statistical Refresher

- Review of core concepts from Empirical Economics I
- Probability and statistics review for econometric analysis
- Sampling, distributions, and statistical reasoning in regression
- Introduction to empirical workflow in STATA

Module 3: Simple Linear Regression

- The simple regression model
- OLS estimation and interpretation
- Goodness of fit
- Statistical meaning of slope and intercept
- STATA applications for one-variable regression analysis

Module 4: Multiple Regression I

- Motivation for multiple regression
- Controlling for additional explanatory variables
- Ceteris paribus interpretation
- Comparing simple and multiple regression models
- STATA implementation of multivariable models

Module 5: Multiple Regression II

- Functional form and model expansion
- Nonlinearities, logarithmic models, and interaction terms
- Dummy variables and categorical regressors
- Reading and interpreting richer regression specifications

Module 6: Inference in Multiple Regression

- Standard errors and sampling uncertainty

- t-tests, confidence intervals, and p-values
- Interpretation of statistical significance
- Practical versus statistical significance in applied economics

Module 7: Multiple Regression III

- Joint interpretation of coefficients
- Model comparison and regression refinement
- Expanded applied work with multivariable regression
- STATA-based interpretation and output analysis

Module 8: Model Specification and Omitted Variables

- Omitted variable bias
- Inclusion of irrelevant regressors
- Misspecification and model design
- Measurement problems and interpretation limits
- Empirical implications for causal claims

Module 9: Heteroskedasticity

- Nature and sources of heteroskedasticity
- Consequences for OLS inference
- Robust standard errors
- Testing and practical correction strategies in STATA

Module 10: Advanced Inference Topics

- Joint hypothesis testing
- F-tests and model-wide significance
- Testing linear restrictions
- Interpreting multiple-parameter tests in applied work

Module 11: Time Series and Serial Correlation

- Introduction to regression with time series data
- Trends, dynamics, and time ordering
- Serial correlation and its consequences
- Introductory approaches to time series inference
- Applied time series examples in economics

Module 12: Midterm Review and Assessment

- Structured review of core regression and inference topics
- Midterm assessment
- Transition from course foundations to independent empirical work

Module 13: Introduction to Panel Data

- Pooled cross sections and panel data structures
- Why repeated observations matter
- Within-unit and between-unit variation
- Introductory fixed effects intuition
- Panel-data applications in economics

Module 14: Limited Dependent Variables

- Why some outcomes are not well modeled by standard linear regression
- Binary outcomes and qualitative response settings
- Introductory interpretation of limited dependent variable models
- Applications in labor, education, and policy research

Module 15: Instrumental Variables

- Why endogeneity creates problems for OLS
- Sources of endogeneity: omitted variables, simultaneity, measurement error
- Logic of instrumental variables estimation

- Relevance and exogeneity conditions for valid instruments
- Interpretation of IV estimates in applied economic research
- Comparison of OLS and IV results
- Introductory STATA implementation of IV regression

Module 16: Research Design and Project Development

- Developing an empirical research question
- Connecting theory, data, and identification strategy
- Data selection, model construction, and preliminary results
- Proposal development and project milestones
- Peer feedback and revision of empirical analysis

Module 17: Additional Advanced Topics in Applied Econometrics

- simultaneous equations and identification
- forecasting considerations
- policy evaluation extensions
- further panel-data applications
- Integrative discussion of how econometric tools are used in modern empirical work

Module 18: Final Integration and Course Conclusion

- Final review of major concepts
- Synthesis across regression, inference, panel data, LDVs, and IVs
- Final examination
- Final empirical research project submission and presentation

Problem Sets

Problem sets are designed to build technical fluency and reinforce econometric reasoning. These assignments typically combine conceptual questions, interpretation tasks, and computational exercises using STATA. Students should expect a mix of short analytical items and longer applied questions.

Collaborative work on problem sets may be permitted in small groups, subject to instructor guidelines. However, all submitted work must accurately reflect the contributors and comply with course policies. Late submissions will not be accepted unless prior arrangements have been approved.

Midterm Assessment

The midterm evaluates students' understanding of material covered in the first half of the course, including regression foundations, inference, and early multiple-regression topics.

Final Examination

The final exam is comprehensive, with emphasis on cumulative understanding of econometric concepts, interpretation of results, and application of methods introduced across the term. Students will be expected to synthesize multiple course topics rather than treat each concept in isolation.

Empirical Research Project

A substantial empirical project is a central part of the course. Students will develop an original research question, identify and work with data, conduct preliminary analysis, and present evidence-based findings. The project is intended to integrate the full range of course skills, including question formulation, data handling, regression analysis, interpretation, and communication of results. Draft checkpoints, proposal stages, or presentation requirements will be assigned during the term.

STATA Laboratory and Applied Data Analysis Sessions

A required STATA laboratory component is embedded in this course to strengthen students' practical econometric skills. The lab is designed to complement lecture material by giving students guided experience with data management, regression implementation, diagnostic testing, and empirical interpretation using STATA.

Through the lab sessions, students will move beyond conceptual understanding and learn how econometric analysis is actually conducted in applied economics. Lab activities will emphasize replication of lecture concepts, interpretation of statistical output, development of coding fluency, and preparation for the empirical research project.

Assessment

Assessment Type	% of Final Mark
Problem Sets	15%
Midterm Assessment	20%
Final Examination	30%
Empirical Research Project	30%
Class Participation	5%

<i>Range</i>	<i>Letter Grade</i>
90% - 100%	A
80% - 89%	B
70% - 79%	C
60% - 69%	D
< 60%	U

Textbooks and Study Materials

Students are expected to obtain access to **STATA**, which will be used throughout the course for data management, estimation, and applied problem solving. Because the software will be used regularly from the beginning of the term, students should ensure access as early as possible.

Jeffrey M. Wooldridge, *Introductory Econometrics: A Modern Approach*

Supplementary readings, notes, data files, and assignment materials will be distributed through the course site.