

FIN-403

**Econometrics**

Fuster Andreas

Cursus	Sem.	Type
Financial engineering minor	H	Opt.
Financial engineering	MA1, MA3	Obl.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	Written
Workload	120h
Weeks	14
<b>Hours</b>	<b>4 weekly</b>
Lecture	2 weekly
Exercises	2 weekly
<b>Number of positions</b>	

**Remark**

For sem. MA1

**Summary**

The course covers basic econometric models and methods that are routinely applied to obtain inference results in economic and financial applications.

**Content**

- Linear regression models
- Ordinary least squares estimation
- Hypothesis testing and confidence intervals in linear regression models
- Heteroskedasticity and autocorrelation
- Generalised least squares
- Instrumental variables estimation
- Generalized method of moments
- Maximum likelihood estimation
- Introduction to time series models

**Keywords**

Econometrics; linear regression; ordinary least squares; instrumental variables; generalized method of moments; maximum likelihood estimation.

**Learning Prerequisites****Recommended courses****Important concepts to start the course**

- Matrix algebra;
- Probability and distribution theory (incl. conditional expectation and variance, normal, Chi-squared, Student, and F distributions);
- Statistical estimation and inference (incl. point estimation, interval estimation, hypothesis testing);
- Large-sample distribution theory (incl. convergence in probability, convergence in distribution, central limit

theorem);

- Familiarity with R, Matlab, Python or Stata is recommended for applied exercises (e.g., empirical analysis, simulations).

## Learning Outcomes

By the end of the course, the student must be able to:

- Describe the basic assumptions of the linear regression model.
- Test whether the basic assumptions of the linear regression model are met in the data using formal statistical procedures.
- Derive statistical estimators like least squares and instrumental variables estimators.
- Recall basic goodness-of-fit measures like R-squared.
- Construct linear regression models from actual data using statistical variable-selection techniques like t-statistics and F-tests.
- Describe the main advantages and disadvantages of likelihood-based and instrumental variable-based inference procedures.
- Carry out hypothesis testing procedures.
- Discuss asymptotic properties of linear and nonlinear estimators such as consistency and efficiency..
- Conduct team-work and write an econometric report about linear and nonlinear regression models.
- Apply the theoretical concepts using econometric software to analyze actual data.
- Discuss asymptotic properties of linear and nonlinear estimators such as consistency and efficiency.

## Transversal skills

- Use a work methodology appropriate to the task.
- Continue to work through difficulties or initial failure to find optimal solutions.
- Use both general and domain specific IT resources and tools
- Demonstrate the capacity for critical thinking

## Teaching methods

Lectures and exercise sessions.

## Expected student activities

- Attend and participate in lectures;
- Attend and participate in exercise sessions;
- Review lecture material and complete exercises/projects,
- Write a midterm exam;
- Write a final exam.

## Assessment methods

- 15% Applied projects
- 25% Midterm exam
- 60% Final written exam

## Supervision

Office hours	No
Assistants	Yes
Forum	Yes

## Resources

### Virtual desktop infrastructure (VDI)

Yes

## Bibliography

- Davidson, R., Mackinnon, J. G. (2009) *Econometric Theory and Methods*. International edition. Oxford University Press.
- Greene, W. H. (2018) *Econometric analysis*. Eighth edition. Pearson.
- Hayashi, F. (2000) *Econometrics*. Princeton: Princeton University Press.
- Stock, J., Watson, M. (2019) *Introduction to Econometrics*. Fourth Edition. Pearson.
- Verbeek, M. (2017) *A Guide to Modern Econometrics*. Fifth Edition. Hoboken: John Wiley & Sons.
- Wooldridge, J. M. (2018) *Introductory Econometrics: A Modern Approach*. Seventh edition. Boston: Cengage.

## Ressources en bibliothèque

- [Econometrics / Hayashi](#)
- [Introductory Econometrics: A Modern Approach / Wooldridge](#)
- [A Guide to Modern Econometrics / Verbeek](#)
- [Econometric Theory and Methods / Davidson](#)
- [Econometric analysis / Greene](#)
- [Introductory Econometrics for Finance / Brooks](#)

## Moodle Link

- <https://go.epfl.ch/FIN-403>

## Prerequisite for

- Advanced topics in financial econometrics
- Credit risk
- Derivatives
- Financial econometrics
- Fixed income analysis
- Investments