

# Financial Econometrics Syllabus

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Financial Econometrics AS.440.617.51

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Lecture: Monday 6-8:30pm

Instructor

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Office hours: After regular class time and by appointment

## **Course Description**

The objective of this course is to provide a comprehensive and systematic account of financial econometric models and their applications to modeling and prediction of financial time series data, focusing on asset returns. While econometric theory is briefly touched on, most of the emphasis is on applied time series modeling and forecasting. Students at the end of the course will have a working knowledge of financial time series data and gain expertise in the software to conduct the analyses.

In 14 weeks, the course is going to cover the following topics:

1. Returns and their empirical characteristics
2. Measuring dependence between returns: correlation, tail dependence
3. Linear time series models and their applications
4. Conditional heteroscedastic models
5. High-frequency data analysis and market microstructure
6. Extreme values, quantiles and value at risk
7. Multivariate models, factor models
8. Nonlinear models and their applications
9. Network analysis

## **Course Requirements**

Most of the textbook problems can be solved using R or MATLAB. Although not required, programming in these softwares will help you understand the math behind the problems. Feel free to use other softwares you find handy, STATA, Mathematica, etc.

The course grade will be determined by a midterm, a final project, 5 problem sets and class participation. The scores are averaged with the following weighting scheme:

Participation: 10%

Midterm: 30%

Final Project: 30%

Problem Sets: 30%

The midterm will be held in class on the 7th lecture meeting. The final will be a term project and students will present in groups in the last class and turn in a write-up of the project. The project will be graded based on the presentations and the write-up. There will be five problem sets. The grade of the problem sets will be on a scale of 1-10.

## **Textbooks**

The text for this course is *Analysis of Financial Time Series* by Ruey S. Tsay (John Wiley, 2010), 3rd edition, ISBN 0470414359.

## **Schedule**

The following is an approximate schedule of the topics to be covered during each class. This schedule is subject to change. The lectures will be closely tied to the textbook, and optional readings will appear after some lectures.

Lecture 1: Asset returns and their characteristics (Chapter 1)

Lecture 2: Measuring dependence between returns: correlation, tail dependence (Chapter 2)

Lecture 3: Linear time series models and their applications (Chapter 2), PS1 due

Lecture 4: Linear time series modeling – unit root and seasoning (Chapter 2)

Lecture 5: Volatility modeling via conditional heteroscedastic models (Chapter 3), PS2 due

Lecture 6: High frequency data analysis (Chapter 5)

Lecture 7: Midterm

Lecture 8: Value at Risk (VaR) and quantiles (Chapter 7), PS3 due

Lecture 9: Extreme value theory (Chapter 7)  
Lecture 10: Multivariate models (Chapter 8), PS4 due  
Lecture 11: Factor models (Chapter 9)  
Lecture 12: Nonlinear models and their applications (Chapter 4), PS 5 due  
Lecture 13: Financial networks  
Lecture 14: Final (presentation)