

E823 Advanced Time Series Analysis (Autumn 2019)

Instructor:

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Lecture Time:

Monday 15:30-17:00 in L7, 3-5, room P043
Thursday: 10:15-11:45 in L7, 3-5, room P043

Course Description:

The lecture will focus on multivariate time series models. After reviewing a few issues on stationary univariate time series models discussed in Advanced Econometrics III, we will first deal with stable VAR models and their use for forecasting, Granger causality and impulse response analysis. To this end, we will also discuss important issues on asymptotic- and bootstrap-based inference. Afterwards, we briefly discuss stable VARMA processes and infinite-order VARs. Finally, we consider integrated multivariate processes after a short re-cap of unit root econometrics. To this end, we will also deal with cointegration, including VEC modelling. The course both addresses asymptotic analyses as well as implementation issues. Accordingly, tutorial sessions are also devoted to coding and empirical problems besides addressing theoretical problems.

In the last part of the course, participants introduce or discuss in more details (further) model classes by giving presentations and writing a paper. We may cover e.g. Bayesian VARs, structural VARs, factor-augmented VARs, VARMA models, etc.. This course is complementary to the course Structural Vector Autoregressive Analysis offered by Matthias Meier. While the latter course focus on structural modelling approaches from an applied macro perspective, we take an econometric approach and deal with multivariate $I(1)$ approaches, VECM and VARMA models in more detail.

Pre-requisites:

For participating in the course you have to pass Advanced Econometrics I-III. Accordingly, I expect that participants have an appropriate background knowledge on stable ARMA models, unit root econometrics, and bootstrap methods.

Grading: Assignments, Presentations, Paper

Grading for this course will be based on three assignments (30%), one presentation (30%), and a paper (40%). The assignments will mostly involve theoretical questions but also cover empirical issues and practical implementations of the methods discussed in class. The grade for each assignment will be on a 1-4 scale: 1. above 70% correct, 2. above 40% correct, 3. below 40% correct (but attempted), 4. not handed in. The solutions and empirical output/programming code must be sent by email. Answers will be discussed in the tutorial sessions. Everybody has to present at least once a solution to a problem in class.

Presentations

The idea is that everyone of you acquire profound knowledge of a further model class. We can be rather flexible here. We should discuss early on what is of most interest to you. I have reserved five slots for your presentations towards the end of the course.

Course Outline:

1. Re-cap I: concepts and stable ARMA processes
2. Stable VARs: model framework, estimation and specification, forecasting, Granger-predictability
3. Impulse response analysis and bootstrap confidence intervals
4. VAR(∞) and stable VARMA models
5. Re-cap II: unit root econometrics and deterministic trends
6. Multivariate I(1) processes
7. Cointegration and VEC models

Lecture Plan:

Here is a preliminary plan how lectures, tutorials and assignments are scheduled.

	Tuesday	Thursday
Week 1: 02.09./05.09.	Lecture (Part 1)	Lecture (Part 1)
Week 2: 09.09./12.09.	Lecture (Parts 1 & 2)	Tutorial (Problem Set 1)
Week 3: 16.09./19.09.	Lecture (Part 2)	Lecture (Parts 2)
Week 4: 23.09./26.09.	Tutorial (Problem Set 2)	Tutorial (Problem Set 2)
Week 5: 30.09./03.10.	Lecture (Part 3)	Holiday
Week 6: 07.10./10.10.	Lecture (Part 3) & Tutorial (Problem Set 3)	Tutorial (PS 3, Assignment 1)
Week 7: 14.10./17.10.	Lecture (Part 4)	Lecture (Part 4)
Week 8: 21.10./24.10.	Lecture (Part 5)	Session cancelled
Week 9: 28.10./31.10.	Tutorial (Problem Set 4)	Tutorial (Assignment 2) & Lecture (Part 6)
Week 10: 04.11./07.11.	Lecture (Part 6)	Tutorial (Problem Set 5) & Lecture (Part 7)
Week 11: 11.11./14.11.	Lecture (Part 7)	Tutorial (Problem Set 6)
Week 12: 18.11./21.11.	Presentations	Tutorial (Assignment 3)
Week 13: 25.11./28.11.	Presentations	Presentations
Week 14: 02.12./05.12.	Presentations	Presentations

Assignment 1: provided at 19.09., due at 30.09. before class

Assignment 2: provided at 10.10., due at 21.10. before class

Assignment 3: provided at 07.11., due at 18.11. before class

Course Material:

Here, I only list the main references. I will provide detailed comments on the reading for each part of the course in separate documents. These also include additional references for a more detailed study of certain issues.

Brüggemann, R., Jentsch, C. and, Trenkler, C. (2016), Inference in VARs with conditional heteroskedasticity of unknown form, *Journal of Econometrics*, 191, 69-85.

Dufour, J.-M. and Pelletier, D. (2014), Practical methods for modelling weak VARMA processes: Identification, estimation and specification with a macroeconomic application, *Discussion paper*, McGill University, CIREQ and CIRANO.

Hayashi, F. (2000), *Econometrics*, Princeton: Princeton University Press, Sections 2.1-2.3, 2.10-2.12, Ch. 6,9-10.

Hamilton, J.D. (1994), *Time Series Analysis*, Princeton: Princeton University Press, Ch. 2-3, 5, 7-8, 15-20.

Kilian, L. and Lütkepohl, H. (2017), *Structural Vector Autoregressive Analysis*, Cambridge: Cambridge University Press, Ch. 2-4, 12.

Lütkepohl, H. (2005), *New Introduction to Multiple Time Series Analysis*, Berlin: Springer Verlag, Ch. 1-4, 6-9, 11-12, 15 Appendix D.

White, H. (2000), *Asymptotic Theory for Econometricians*, revised edn, San Diego: Academic Press