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ECON 4160

Econometrics – Modeling and systems estimation. Autumn semester 2018.

Consult the official semester page for information about the *Schedule*, *Syllabus* and *Examination* and *Compulsory tuition activities*.

The Schedule on the semester page distinguishes between teaching in Plenary sessions and in Group sessions.

"Plenary sessions" are in practice fifteen regular (2x45 minutes) lectures (plus one joint with ECON 5106), and six (2x45 min) computer lab sessions.

"Group sessions" are seminars meetings (2x45) where we will work with exercise sets. The seminars are organized in two groups (Group 1 and Group 2). You choose the one most practical for you. The exercises will be posted on Canvas one week before the seminar meetings.

Course portfolio/obligatory work: One of the seminar exercise sets (details will come later) is a compulsory assignment. Your written answers to that exercise set will be graded (Pass/Failed), and you must have received the Passed grade in order to sit for the 3 hour school exam on 26. November 9:00 AM.

Plan for lectures

The details can change when the course gets under way (information will then be given in the class and on the web-page).

References to the syllabus are to the chapters in Nymoen, R. "Dynamic Econometrics for Empirical Macroeconomics". The book, in pdf format, will be available from the semester page (Canvas) from 10 august. A few supplementing lectures notes will be made available during the semester.

Lecture 1 Introduction (Monday 20 August)

Definitional characteristics of dynamic models. The cobweb model is used to introduce several central topics. For example negatively autocorrelated responses to a shock, reduced form equations and final equations of a model, stable and unstable dynamics, and stationary state and equilibrium correction. A simple Keynesian macro model is used to illustrate

positive autocorrelation. Examples of estimation of positive and negative autocorrelation. Examples of real world data that display negative and positive autocorrelation.

Chapter 1.

Lecture 2 Review of econometric theory (Tuesday 21 August)

Maximum Likelihood (ML) estimation of the Gaussian IID regression model. Method of Moments estimation (MM). Delta method. Definition and IV-estimation of a structural equation. Multivariate regression and multivariate structural equations in matrix notation. Mis-specification tests.

Chapter 2.

Lecture note: "Background to 4160: Review of key concepts of statistics, with exercises".

Lecture 3 Review of econometric theory (Thursday 23 August, joint with ECON 5106)

The lecture will to some extent overlap with Lecture 2, but it will also review statistical concepts (including random variables) and important theorems of mathematical statistics.

Lecture 4 Difference equations I (Tuesday 28 August)

Deterministic difference equations. Stochastic difference equations with constant coefficients. The companion form. Lag operator notation.

Chapter 3.1-3.5.

Lecture 5 Difference equations II (Tuesday 4 September)

Impulse responses and dynamic multipliers. The final form of a multi-equation system. Companion form representation of a system.

Chapter 3.6-3.9.

Lecture 6 Stationary time series (Tuesday 11 September)

Time series, stochastic processes and difference equations. Stationarity. Ergodicity. Stationary time series variables. ML estimation of AR(1) and of the ARMA class of models. Generalization to Multiple-equation processes.

Chapter 4.

Lecture 7 The VAR (Tuesday 18 September)

Estimation of the Gaussian VAR. Impulse response functions of VAR. Forecasting from VARs.

Chapter 5.

Lecture 8 Single equation models (Tuesday 25 September)

ADL model equations. Dynamic multipliers. ECM form of ADL. Special cases of ADL. Volatility modelling (ARCH).

Chapter 6.

Lecture 9 Multiple equation models I (Tuesday 2 October)

Extending the system: VAR-EX. Modelling the VAR-EX with conditional and marginal equations and by Simultaneous Equations Models (SEM). Identification.

Identification and estimation of structural equations and models.

Chapter 7.1-7.6.

Lecture 10 Multiple equation models II (Tuesday 9 October)

Recursive models and Structural VAR (SVAR). Estimation methods for structural equations. Model equations with rational expectations, and future dependent models.

Chapter 7.7-7.11

Lecture 11 Exogeneity (Tuesday 16 October)

Weak exogeneity. Granger causality and strong exogeneity. Parameter invariance and super exogeneity. Testing exogeneity.

Chapter 8.

Lecture 12 Non-stationarity (Monday 22 October)

Deterministic trend. Stochastic trend and integrated series. Spurious regression. The Dickey-Fuller distribution and testing the unit-root hypothesis.

Chapter 9.

Lecture 13 Cointegration I (Tuesday 23 October)

Engle and Granger representation theorem. Estimating a single cointegration vector. Testing rank zero against rank equal to one.

Chapter 10.1-20.4

Lecture 14 Cointegration II (Tuesday 30 October)

Multiple equation cointegration

Chapter 10.5.

Lecture 15 Automatic variable selection (Tuesday 6 November)

Chapter 11

Lecture 16 Model based forecasting (Tuesday 13 November)

Modelling for policy and forecasting.

Chapter 12

Computer classes

As noted, there are six Computer Classes. The first CC will present the main user interface of PcGive (part of the OxMetrics family of econometric programs). PcGive is well suited for learning dynamic econometric modelling, and for use in your own projects. The program is very well documented, with manual/books (in pdf format) that include instructive tutorials.