# Macroeconometrics (Y1): Syllabus

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## Description

The goal of the course is to provide an introduction to the methods of modern applied macroeconometrics. The different approaches currently used in applied work are reviewed, including the basics of the empirical dynamic stochastic general equilibrium models (DSGE). The prerequisite is sufficient knowledge of multivariate time series analysis (at least, S3. Advanced Econometrics or equivalent) and advance macroeconomic theory. In addition these, Money and monetary theory (Y1), Open economy macroeconomics would be an asset. In solving DSGEs we limit ourselves on perturbation methods and (log-)linear approximations. We first study model solution techniques, then compute and compare model and data moments, and finally estimate the parameter distribution by Bayesian techniques. Other techniques are reviewed too.

## Goal

The main objective is to develop skills to analyze and validate dynamic stochastic general equilibrium models.

## Course material

Unified treatment of the course material: David N. DeJong and Chetan Dave (2007) *Structural Macroeconometrics*, Princeton University Press, ISBN-13:978-0-691-12648-7 (DD from now-on).
Large part of the time series econometrics may be found from: Hamilton, James D. *Time Series Analysis*. Princeton, NJ: Princeton University Press, 1994. ISBN: 9780691042893. (Ham)
Digestible introduction to Bayesian econometrics: Koop, Gary (2003): *Bayesian Econometrics*, John Wiley & Sons, to those who have the frequentist background.
Canova, Fabio *Methods for Applied Macroeconomic Research*, Princeton University Press.
For the Bayesian estimation of DSGE, the classical review article is An and Schoerfheide (2007) Bayesian Analysis of DSGE Models, Econometric Reviews, 26(2-4), 2007, 113-172.
The toolboxes have also useful material: User Guides of Dynare toolbox (www.dynare.org) and YADA (www.texlips.net/yada). Iris-toolbox (www.iris-toolbox.com) is highly recommended package but lacks methodological user guide. Most of the exercises will be built on the Iris-toolbox.

## Overview

1. Approximating and solving DSGE models
   Techniques in solving the deterministic steady-state, (log)-linearizing, solving a linear model using Blanchard-Kahn, Sims-Klein and AiM approach.
   DD: 1-2; Dynare 3-4; YADA 4-5
2. Time series properties of the model and data
   Here summarize data that can be measured data or generated by the DSGE model. Impulse response functions, spectral analysis, autocovariance function, forecast error variance decompositions, filtering the data and model
   DD 3-5; Ham 3, 6, 10-11; Dynare 3-4; YADA Ch 4-5
3. Calibrating and matching moments
   GMM, single equation methods, calibration, calibrating steady-state, comparing model and data moments
   DD: 6-7; Ham 14

LP Hansen (2000): Generalized Methods of Moments: A Time Series Perspective (and references there-in)

4. Likelihood approach
   Kalman filter and the maximum likelihood, filtering and decompositions, optimization algorithms, Bayesian methods, simulating posterior
   DD: 8-9; Dynare 5-6; YADA 5,8-10; Ham 5, 13
   Michal Andrle, Tibor Hlédik, Ondra Kameník, Jan Vlček (2009) Implementing the New Structural Model of the Czech National Bank

## Course requirements

Students are supposed to have strong background in the (time series) econometrics and in the linear algebra related to econometrics and macroeconomics. Time series analysis courses that are supplied by the Department of Mathematics and Statistics give a good background. Students should be interested in working with dynamic economic models. They are typically macroeconomic models, like DSGE models. Quantitative methods involve programming in matrix languages. Hence, some experience with Matlab (or other matrix language) is very important.

## Exercises

The exercises will be both analytical and computational. It is highly recommended that you acquaint yourself with Matlab/Octave.

## Computation

You need Matlab, Octave or Gauss and a computer. I recommend Matlab (due to Iris-toolbox), but you may survive with Octave with some extra work. Economicum computer class has those tools. Octave is a substitute for Matlab, but then you are stuck with Dynare. The only Matlab package that has most of the desired features is the Iris-toolbox.