Introduction to DSGE Models: Outline

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Preliminaries

Before starting the course, it would be useful for you to read through my notes on solving dynamic stochastic general equilibrium (DSGE) models by linearization (Ambler, 2010a). See the link below to references for the course.

Before starting the course, you should be able to do the following in MATLAB:

1. Find the rank of a matrix.
2. Be able to generate a sequence of N(0,1) random variables.
3. Be able to generate multiple series of shocks of arbitrary variance and with an arbitrary correlation.
4. Calculate the eigenvectors/eigenvalues of a square matrix.
5. Understand the difference between "left" and "right" eigenvectors and know how to use MATLAB to calculate left eigenvectors.
6. Sort eigenvalues into ascending or descending order of absolute value, while keeping the eigenvalues with their associated eigenvectors.
7. Vectorize a matrix.

Course Materials

My lecture notes for the course (one long chapter on numerical simulation by linearization, one chapter on the canonical New Keynesian model, and a list of references for supplementary reading) along with a copy of this syllabus are available in the following directory:
http://www.er.uqam.ca/nobel/r10735/dsge/
The directory is publically readable. The names of the files are self-explanatory. At the end of the notes, you'll find the date that they were last modified. I'll be updating them slightly as I prepare the lectures and in the light of your questions and comments. I'll also be uploading the slides from my lectures as they become available.

1 Introduction

- Why numerical simulation.
- Why linearization.
- What is lost by linearization.
    1. Effects of shocks on stochastic means.
    2. Welfare evaluations.
    3. Impact of shocks on variables that are constant up to a first-order approximation.
- Basic references on numerical techniques.
- Basic references on solving DSGE models.
- Basic references on the New Keynesian model.

2 The Canonical New Keynesian Model

- Basic model.
- Deriving the New Keynesian Phillips curve.
- Shortcut to the New Keynesian Phillips curve.

- Non-zero trend inflation: Yun versus Christiano, Eichenbaum and Evans versus less-than-complete indexation.
- Steady-state effects of non-zero trend inflation.
- The New-Keynesian Phillips curve with trend inflation and imperfect indexation.

3 Solving by Linearization

- Inducing stationarity.
- Cointegration and stationarity transformations.
- Solving for the steady state.
- Linearizing around the steady state versus linearizing based on initial conditions for I(1) variables.
- Choice of initial conditions for I(1) variables: arbitrary or on steady-state growth path.
- Linearization versus log-linearization.
- Measuring variables in growth rates.
- Reducing k-order equations to first-order equations.

4 State Space Representation

- Minimal state space representation.
- Detecting extraneous state variables.
- Dealing with extraneous state variables: substitution versus Schur.
- Costates versus states.
- Stability conditions.
- Indeterminacy and sunspot equilibria.

5 Taking the Model to the Computer

- Matlab.
- Matrix languages and loops versus vectorization.
- Basic simulation algorithm.
- Simulation algorithm for non-minimal state space representations.

6 Simulations

- Stochastic simulations.
- Computing exact moment properties.
- Variance decompositions.
- Unconditional variances and autocovariances: eliminating I(1) variables.
- Unconditional variances and autocovariances.
- Conditional variances and autocovariances.
- Decomposing n-step ahead forecast errors.
- Impulse response functions.
- Perfect foresight simulations and responses to pre-announced policy changes.
- Unobserved shocks and the Kalman filter.
- Judgement and forecasts.

7 Advanced Topics

- Do we need to explain persistent inflation?
- Rule-of-thumb behavior, habit persistence, adjustment costs.

- Policy analysis: welfare and spurious welfare reversals.
- Estimation. Why Bayes?

References

See:
http://www.er.uqam.ca/nobel/r10735/dsge/referenc.tex

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