A PRIMER IN THE ESTIMATION OF
DYNAMIC MACROECONOMIC MODELS

1. Course Outline and Overview

This course aims to introduce students to the formulation, estimation, and policy analysis of a modern dynamic equilibrium model.

Over the last few years, dynamic equilibrium models have progressed in an spectacular way. For the first time, we are able to build and estimate models that fit the data well and that are rich enough for meaningful policy analysis. This remarkable success is the consequence of the confluence of advances in economic theory, computational methods, and simulation techniques. As a proof of these excitement, a growing number of policy making institutions (the ECB, the Federal Reserve Board, the Riksbank, the IMF, and the Bank of Canada) are formulating and estimating models along these lines. Also, a lot of researchers are applying these models to study different aspects of the economy.

How do you build such models? Why do they work? How can you solve them? And how can you take them to the data? Finally, which recommendations of economic policy do they prescribe?

The course will first present a modern dynamic equilibrium model with a rich specification of the nominal component (sticky prices and sticky wages, role of money) and its real component (adjustment costs in investment, variable capital utilization, habit persistence, taxes, open economy). We will discuss the strengths and weakness of this type of models, its microfoundations (or lack of), and the general direction of the research agenda: why we want to formulate such a model, what can we expect from the modelling exercise, and what we cannot. Second, we will review the techniques required to solve the model, basically perturbation theory. Then, we will move towards the estimation of the model, both linearly and nonlinearly, using the likelihood function.

During this week, we will always focus on applications and on the development of good economic intuition, even if sometimes we will need to work a little bit on the theoretical foundations of our work.
2. Outline of the Course

The course will be divided in 9 modules:

- Module 1: Motivation.
- Module 2: Specifying a modern dynamic general equilibrium model.
- Module 3: Solving the model I.
- Module 4: Solving the model II.
- Module 5: Introduction to Likelihood Inference.
- Module 6: Monte Carlo Methods I.
- Module 7: Monte Carlo Methods II.
- Module 8: Filtering.
- Module 9: Inference.

3. Reading List

The reading list is an outline of the material covered in the class. Of course, given the limited amount of time, we will be selective and only cover part of the content of each paper or book. However, such reading list may help you in the future to further your understanding of these type of models.

3.1. Motivation


3.2. Specification of the Model


### 3.3. Solving the Model

**Solving the model linearly:**


**Going beyond linear solutions:**


### 3.4. Introduction to Likelihood Methods


### 3.5. Introduction to Monte Carlo Methods


3.6. Filtering

