

**MODELLING INFORMATION, LEARNING
AND EXPECTATIONS IN MACROECONOMICS**

New York University
Spring Semester 2008

Professor: Kristoffer Nimark

Office: Room 626, 19 West 4th St

Class time and place: Wednesdays 3.30 - 5.30, Room 736, 19 West 4th St

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Overview

Many economic decisions depend on expectations about either inherently unobservable variables or about future realisations of a variable. Different theories of expectations formation will therefore have different implications for economic behavior. This course aims at equipping students with the tools needed to model two alternative theories to the full information rational expectations hypothesis: (i) Imperfectly informed, but model consistent, expectations and (ii) boundedly rational expectations, that is, expectations formed without complete knowledge of the structure of the economy. Both theories have delivered interesting results, ranging from positive predictions about the dynamics of aggregate time series and asset prices, to normative implications about the value of public information and the design of monetary policy. The substantive results from the literature will be discussed along with the specific techniques that were employed to derive them. The Kalman filter is an indispensable tool for modelling information and learning, and some time will initially be devoted to deriving the filter and exploring its properties.

Three good text books that together cover some, but not all, of the course material are Ljungqvist and Sargent (2004), Anderson and Moore (1979) and Evans and Honkapohja (2001). Lecture notes will be provided, but reading articles will also be required.

Administrative matters

Grades will be based on 2 homework assignments (2x30%) and a final (40%).

Week 1: Overview and some basics

Introduction and course overview

Stochastic Processes

Basic manipulations of difference equations

Some useful results from linear/matrix algebra

Week 2: A Benchmark: Full information rational expectations

Model consistent expectations without free parameters

Three ways to solve for linear full information rational expectations equilibria:

- Stable-unstable eigenvalue decoupling
- Method of undetermined coefficients
- Replacing expectations with linear projections on observables

Week 3-4: The Kalman filter and its properties

The scalar filter

The discrete time Kalman filter

Asymptotic stability and convergence to the time invariant filter

Properties of the Kalman filter (Gaussian and non-Gaussian systems)

The Kalman filter and linear projections

The innovation representation

First homework handed out.

Week 5: An Application of the Kalman filter

LQ optimal control with signal extraction from endogenous variables

Week 6-9: Modelling private/heterogenous information

Private information and strategic interaction: Forecasting the forecast of others

The problem:

- The non-applicability of the law of iterated expectations
- Linear projection solution and the exploding dimension of the state

Solution strategies:

1. Short lived private information
 - Finite horizon
 - Lagged revelation of shocks
2. Using common knowledge of rationality
 - Static choices, dynamic filtering
 - Dynamic choices

The information revealed by market outcomes

Real and informational heterogeneity

Second homework handed out.

Week 10-13: Learning and boundedly rational agents

Constant and decreasing gain learning, convergence to rational expectations equilibria

Learning and inflation dynamics

Learning with misspecified models

-The evolution of error detection probabilities

Heterogenous learning

Week 14: Review

Review of course material

Topics for further investigation

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