Quantitative Dynamic Macroeconomics
Computational Methods and Mathematica-based Applications

Doctoral Course, Incentives – Bavarian Graduate Program Economics

29 - 30 October, 2010

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I. Course description

Real world economies regularly undergo several types of shocks. The set of examples is manifold and comprises sudden changes in world prices (e.g., oil price shocks), changes in public policy measures (e.g., increase in R&D subsidies), changes in institutional settings (e.g., integration shocks), and natural disasters (e.g. earth quakes or wars). What are the short run and long run consequences for major macroeconomic variables and for social welfare? Economists are expected to answer these questions. Indeed, quantitative macroeconomic theory provides the required concepts and tools.

The process of model-based analysis comprises three main steps. First, an appropriate macroeconomic model must be set up. Second, the model must be calibrated. Third, the model needs to be evaluated numerically. We discuss a set of prominent dynamic, general equilibrium models and demonstrate how these models can be evaluated to answer the type of questions sketched above. More specifically, transitional dynamics in response to shocks are calculated by applying the powerful relaxation algorithm (Trimborn et al., 2008). This algorithm is implemented in Mathematica. Students will be equipped with the basic knowledge required to set up and numerically evaluate dynamic macroeconomic models.

Sound knowledge of Mathematica is not a necessary requirement. However, the benefit you receive from attending this course increases with the ex ante knowledge of Mathematica. I recommend taking a glance at references (14) and (17).

II. Daily time schedule

9.00-10.30: 1st lecture

10.30-11.00: coffee break

11.00-12.30: 2nd lecture

12.30-13.30: lunch

13.30-15.00: 3rd lecture

15.00-15.30: coffee break

15.30-17.00: problem set

III. Course outline

Day #1 (29 October 2010)

1st lecture: An introduction to Mathematica

Readings: (14), (17)

2nd lecture: Some illustrative applications

Readings: (15), (16)

3rd lecture: Solow model / stochastic Solow Model / Ramsey model

Readings: (1), (2), (12)

problem set: Economic growth with subsistence consumption

Readings: (10), (11), lecture notes

Day #2 (30 October 2010)

1st lecture: Quantifying optimal growth policy

Readings: (3), (4)

2nd lecture: Education and economic growth

Readings: (7), (12)

3rd lecture: Growth under an exhaustible resource

Readings: (5)

problem set: t.b.a.

Readings: lecture notes

IV. Course material

Course material (including lecture notes and problem sets) will be provided at http://www.wifa.uni-leipzig.de/itvwl/makro/lehre/ws1011/qdm-dc.html

V. Reading list

Theory

(1) * Barro, R. J. and X. Sala-i-Martin, Economic Growth, Chapter 1&2, MIT Press, 2004.
(2) Farmer, E., Macroeconomics of Self-Fulfilling Prophecies, Chapter 2.2 & 2.3., MIT Press, 2002.
(3) Grossmann, V., T. Steger, and T. Trimborn, Quantifying Optimal Growth Policy, CESifo Working Paper NO. 3092, 2010.
(4) * Grossmann, V., T. Steger, and T. Trimborn, Dynamically Optimal R&D Subsidies, CESifo Working Paper NO. 3153, 2010.
(5) * Groth, C., A New-Growth Perspective on Non-renewable Resources. In: Sustainable Resource Use and Economic Dynamics, Section 3, ed. by L. Bretschger and S. Smulders, Springer, Dordrecht, 2007.
(6) Jones, C.I. (1995). R&D-based models of economic growth, Journal of Political Economy 103, 759-784.
(7) * Lucas, Robert (1988), “On the Mechanics of Economic Development”, Journal of Monetary Economics, 22, 3-42.
(8) Romer, P.M. (1990). Endogenous technological change, Journal of Political Economy 98, 71-101.
(9) * Solow, R. M. (1956): "A Contribution to the Theory of Economic Growth." Quarterly Journal of Economics 70, 65-94.
(10) * Steger, T.M., Economic Growth with Subsistence Consumption, Journal of Development Economics, 2000, 62 (2), 343-361.
(11) Strulik, H. A Note on Economic Growth with Subsistence Consumption, Macroeconomic Dynamics, 2010, forthcoming.
(12) * Trimborn, T., K.-J. Koch and T.M. Steger, Multi-Dimensional Transitional Dynamics: A Simple Numerical Procedure, Macroeconomic Dynamics, 2008, Vol. 12 (3), 301–319.

Mathematica

(13) Abell, M. and J. Braselton, Differential Equations With Mathematica, 2004, Elsevier.
(14) * Gräbe and Kofler, Mathematica - Einführung, Anwendung, Referenz, 5. Auflage, 2007, Pearson.
(15) * Huang, C.J. and P.S. Crooke, Mathematics and Mathematica for Economists, Blackwell Publisher, 1997
(16) Varian, H., Mathematica for Economists, Handbook of Computational Economics, Vol. 1, H. M. Amman, D. A. Kendrick and J. Rust (eds.), Elsevier Science 1996, Chapter 11.
(17) * Weiß, Christian H., Mathematica, Eine Einführung, 2. Auflage, in deutsch, Dezember 2008, RRZN-Handbücher, Universität Hannover.

Note: References marked with „*“ are of primary importance.