

AGENT-BASED MODELING IN ECONOMICS AND BUSINESS (073 261)

Course Outline Summer Term 2023

Prof. Michael Roos / Michelle Alferts

CONTENT

Economic modeling is the core of most economic analysis, but how can models really help us understand and analyze the economy? How well do equilibrium models, such as the ones taught in most economics lectures, represent the real-world phenomena they try to replicate? What are their strengths and limitations?

In light of these questions, the seminar introduces agent-based models (ABMs), a class of computational models that approaches economic questions from a different perspective. ABMs treat the economy as a complex adaptive system, where macroeconomic phenomena emerge from the behavior and interaction of heterogeneous agents. In contrast to equation-based equilibrium models, ABMs cannot be solved mathematically, but need to be simulated and the output analyzed afterwards.

ABMs are a flexible research tool that can be applied to many different topics and for various purposes. The seminar focuses on market dynamics, starting from a standard supply and demand framework. After implementing a simple market model, assumptions about the structure of the artificial economy and agents' behaviors will gradually be loosened to explore ways of modeling more realistic representations of market interactions.

To implement these models, the seminar utilizes NetLogo, a beginner-friendly software designed to program ABMs. Students will be introduced to the software and gradually learn how to work with it over the course of the seminar.

By the end of the semester, students should be able to expand existing NetLogo ABMs or even program their own small models. After finishing the course, agent-based modeling can further be used as a research method for Bachelor theses or applied in certain Master modules.

MODULE OBJECTIVES

- You understand the purpose of economic modeling and how far models can be used to understand and analyze economic phenomena.
- You learn how to work with ABMs and how to interpret their results.
- You acquire basic knowledge to implement your own agent-based models.
- You will learn how to use the ABM programming platform NetLogo.

PREREQUISITES

You will need good skills in written and spoken English. Some affinity to computers and programming would be helpful, but no previous coding experience is required.

ORGANIZATION AND ASSESSMENT

The seminar is composed of theoretical sessions, interactive discussions, and programming exercises. The theoretical parts address the methodology of economic modeling in general and agent-based modeling in particular. Building on this, the usefulness of different modeling approaches for explaining economic phenomena will be discussed. Finally, coding tutorials first introduce the software NetLogo, which is then used to develop different types of market ABMs together in class.

At the end of the semester, students will be tasked with extending one of the models developed in the course in teams of 2 - 3 students. The seminar papers will be based on these model extensions.

Apart from the seminar paper, two small coding assignments ("Studienleistungen") need to be passed during the semester. These assignments are not graded, but are meant to allow for practicing the use of NetLogo and receiving feedback on it.

Deadline for the term paper: 14.8.2023

Participants:	15
Assessment:	Term paper (Seminararbeit): 100% Two ungraded assignments that must be passed during the semester.
Time:	Wednesday 12:15 – 13:45 h For details see schedule below!
Place:	GD 03/512
Start:	Wednesday, 05.04.2023

REGISTRATION

It is necessary to register for this module in FlexNow **and at the chair**, because the number of places is limited to 15.

The **registration procedure at the chair** consists of two steps:

1. You have to sign in to the Moodle course.
2. You have to show up at the first seminar session (05.04.23).

If there are more than 15 applications, we will choose participants randomly.

If there are free places available, you can join the course after the first round of registrations.

The registration phase in FlexNow is: [17.04.2023 – 28.04.2023](#)

Note that the registration and deregistration phase ends on April 28th, so you need to decide whether you want to participate in the course by then!

MOODLE

All announcements and materials will be shared in the Moodle course (*Agent-Based Modeling in Economics and Business (073261-SoSe23)*). No password is required for the registration.

SCHEDULE

Meeting *	Topic
05.04.	Course organization, introduction to agent-based modeling
12.04.	Economic modeling: Equilibrium models vs. ABMs
19.04.	Introduction to NetLogo
26.04.	First coding exercises I
03.05.	First coding exercises II
10.05.	Developing ABMs: The modeling process
17.05.	Modeling session: Market ABMs I
24.05.	Modeling session: Market ABMs II
07.06.	Modeling session: Market ABMs III
14.06.	Modeling session: Market ABMs IV
21.06.	Modeling session: Market ABMs V
28.06.	Preparation for seminar papers: Structure, grading, project ideas
05.07.	Example of an advanced environmental ABM / work on seminar projects
12.07.	Open questions on seminar papers / buffer

* Highlighted entries indicate coding exercises and joint modeling sessions. Students are strongly advised to bring their own laptops to these meetings (all materials will be uploaded on Moodle, so coding exercises can be caught up at home if necessary).

This schedule is preliminary and subject to change. Potential changes will be announced via Moodle.

CONTACT

If you have any questions, you can contact michelle.alfers@rub.de.