SMASO

Practical work - Micro-economics with agents

8 March 2016

In this assignment it is recommended to use the programs (functions) of R *Setup* and Agent.micro.econ (simplified function, 2012) as the basis for the experiments described below. Objective 1 needs minimal changes to the programs, while further Objectives require some changes.

Preface

Function *Setup()*

This function can be seen as an auxiliary program that allows to set the values of some objects -variables, data frames or vectors that are required by the *Agent.micro.econ* program. Thus, the *setup ()* function allows to set the values of initial quantities of goods , the values of importance (*beta*), prices, quantities produced and consumed (related to the production consumption) and fixed consumption (independent of production).

The program joins all of these variables in a list (e.g. dados1), which is defined as a global variable (using <<). Thus, it is possible to initiate the work with an empty workspace of R, read the "source code" in and run the *setup ().* Then it is possible to run the program, e.g.

```
Agent.micro.econ (dados1,2))
```

with the list previously created (dados1), while indicating the number of weeks (ex. 2).

The *setup ()* function contains, in addition to the list *dados1* (4 agents, property 4) the list dados2 with 12 agents, 3 per sector; 5 goods - agriculture, clothing, transport, health and money.

The user can change the setup to change the values or define another set of variables/objects (data frames / vectors) representing a desired situation.

Altering the production of a given good

The increase (decrease) in production of a given good of an agent (Ex. agricultural agent 1) involves increase (decrease) of values in different data frames:

- Increase of production by X% in the table with the production values (data frame "prod"),
- Increase of "*variable consumption*" by the same value of X% (representing the consumption of resources, such as, raw materials etc.) (data frame *cons.var*).

In addition to "*variable consumption*" there is still "*fixed consumption*" which represents certain quantities consumed, even if the agent does not produce anything.

Objective 1: Study the effects of varying some parameters on the results of simulation *(basic)*

Define some basic situation (ex. dados2), run the simulation for 5 or 10 weeks and observe / critically analyze the evolution of prices, wealth and the utility of the agents.
Change the values of some of the input variables and analyze the effects on prices, wealth, utility agents. It is suggested to vary two of the following aspects:

- Ratio between the quantities produced and consumed by all agents at some time, creating the situation of overproduction / underproduction of a given good, or
- Productivity (agent can produce more with the same resources), or
- Values of importance of goods, or
- Initial quantities of goods.

Objective 2: **Production control of one good:** *(medium / advanced)*

The aim is to study how to define the strategy of the agents regards a particular good, that is, whether to increase or decrease its production, under the assumption that none of the other agents alters its strategy. In the definition of his strategy the agent could use values of certain variables, such as:

- Price and a difference in two (or more) consecutive weeks, or
- Profit associated with the given good, or
- Changes in the total wealth of the agent, or
- Changes in the value of all goods agent.

The aim is to analyze 1 or 2 alternatives outlined above and see what the consequences are of this decision on the amount of wealth / utility of goods of agents after a few weeks of simulation.
Another aim could be also to analyze how some of the conditions below can affect the outcome of the simulation.

- if the agent controls the production of the sector;
- if there is situation of underproduction / overproduction;
- if the importance values of goods have changed etc..)
  (select one of above)

Objective 3: Controlling the production of two goods: *(optional - advanced/bonus)*

Another extension of the previous point (objective 2) involves the presupposition that the agent in question can produce two (or more) different goods, and thus assigns part of its resources (variable consumption) to the production of each of the goods.
What is the strategy that the agent should use to decide whether to increase (decrease) the production of the goods, and decrease (increase) the production of another good? Implement the strategy through a change in the program.