Technology Choice

Date: 29, May 2023
Name: Md Mohidul Haque

1. Experiment

The following experiment is designed:

- Experimental units: The experimental unit are replication runs of the ABM. 100 replications will be used for different number of possible technologies.

- Hypotheses:
  -- H : For different number of possible technologies there is a difference in the market concentration measure M (normalized Hirschman-Herfindahl index) for Erdos-Renyi (predefined with p = 0.1) network structure.

- Treatments: Since the effect of different number of possible technologies will be investigates in the Erdos-Renyi network type, treatments will be use different number of available technologies (set different values for the parameter n_technologies).

- Response: One market concentration measure will be measured for each simulation run:
  -- Normalized Hirschman-Herfindahl index: M

- Rejection of the null hypothesis: The null hypothesis will be rejected for any two treatments such that the ensemble means of the measure will not be within each other's standard deviation.

- Reproducibility of the results: In order to make the results reproducible, ensembles (series of simulations with the same parameter values) of size 100 will be used. For each run, the measures M computed. For each treatment, mean and standard deviation are computed.

- Scope parameter: Each simulation run will be conducted for 500 time periods and with 100 agents. (Reduced compared to the default of 5000 periods and 1000 agents in script 1.)

2. Approach

A class *Series* for producing the series of simulation runs with identical parameters is defined which creates and runs a specified number (100) of Simulation objects and collects the results.
In addition a class *Experiment* for the entire experiment is defined. The treatment parameters (n_technologies) are passed through from the Experiment class instance to the respective Series to all the Simulation objects.
Functions are defined for the computation of M.

3. How to run the code

The script can be executed directly. It will print the resulting means and standard deviations into the interpreter when the experiment is complete.

4. Code
Please see the .py file.

5. Results
Normalized Hirschman-Herfindahl index:

$$M \text{ (First Series)} = 0.28 \pm 0.17$$
$$M \text{ (Second Series)} = 0.15 \pm 0.09$$

H can not be confirmed (difference of normalized Hirschman-Herfindahl index).

6. Interpretation
On average Erdos-Renyi network has higher normalized Hirschman-Herfindahl index for small number of possible technologies.