Using Exact Sciences Modeling Tools to Understand Social Phenomena

Course #: 55772

Exercise #3: The emergence of social classes
Due: May 3rd, 11:50 pm, on Moodle

General Instructions:

- Unless stated otherwise, submission is done individually. We rely on trust. You may discuss assignments verbally, but do not share solutions with other students.
- You may use examples from the Internet, but use them as an inspiration and make them your own.
- Your homework should be submitted through Moodle. Please zip your files to ex_3_First_last.zip (with your first and last name). The zip should include: 1) a PDF document (no .docx and no jpg) with your responses, pseudo code, explanations, insights etc. 2) Your code files. Your code will not be tested, but we might use it as a reference in case we need clarifications. Please keep good coding standards, and document your code properly.
  You may use MatLab, Python, C/C++, or Java. If you want to use other programming language, please get our approval first.
- Please use proper language and correct grammar (Hebrew or English), explain clearly what you do, use graphs and charts if needed.
- No scanned handwritten works please.
- We respect the business etiquette: No late submission.

<u>Grading</u>
The homework grading will be based on the following parameters:

1. Correctness of the analytical response, clarity of presentation
2. Model compatibility: how does your model matches the description?
3. Implementation: Based on the pseudo-code (we might use the code if clarifications are needed).
4. Insights quality: Try to find non-trivial insights.
5. Creativity
6. Visualization: Your insights should pop-out of the figures you choose.

   Tips for visualization:

   - Label each figure
   - Explain each figure in the text
   - Label each axes + what are the units?
   - Clean figures: Avoid unnecessary details in figures.

Task 1 (and only): Implementing the Epstein model

Implement the model we studied in class. Assume a population size of 200 people.

1) Start with a population of one type of agents. Use ε=0.1. Use the Nash demand game parameters as we used in class (30, 50, 70). m=10.
   a. Run the simulation ~100 times. For each time check whether the final result leads to equity norms or to fractious norms. Arrange your results in a table showing the initial conditions (Initial percentage of demanding M,L, H, which you choose randomly), and the resulting percentages of the optimal response. In what percentage of the cases you arrived to equilty/fractatious norms?
   b. Choose several runs out of your list of 100 runs and present them using simplex representation. Describe the results.

2) Now do the same with a two agent types model, 100 agents of each type.
   a. Run the simulation ~100 times as before. This time note in your table the inter group and the intra group response, and not whether you have reached equity norms, fractatious norms, or discriminatory norms.
   b. For a selected set of interesting cases, display the results of the inter-type and intra-type equilibrium using a simplex representation. Why did you choose those cases? describe the results and your insights.

Be creative, use your modeler's mind, and have fun!