Using Exact Sciences Modeling Tools to Understand Social Phenomena

Course #: 55772

Exercise #5: Rebel Rebel
Due: Wednesday June 20, 11:50 pm, on Moodle
The homework will be the basis for class discussion. No late submissions!

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_5_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 g ood 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: Read and implement Epstein rebellion model

1. Please read the attached paper: Epstein, Joshua, 2002 "Modeling civil violence: An agent-based computational approach", PNAS 99 (3), 7243-7250.
2. Implement in code the first model "**Civil Violence Model I: Generalized Rebellion Against Central Authority**". Use the model parameters specified in the paper (Run 5 of Table 2). No need to implement the graphics, unless you really want to do so.
3. Plot 3 graphs of the level of rebelliousness (the number of agents showing rebellious behavior) as a function of:
    a. cop density
    b. max jail term
    c. the level of legitimacy
4. Run a full factorial experiment.
5. Using your results, find the best fit using a linear model (in social science they call it multiple regression) when the dependent variables is the level of rebelliousness and the independent variables are the values of cop density, max jail term, and the level of legitimacy. Display your results – which factor is stronger?
6. Find a metric for measuring the individual deceptive behavior. Explain it. How does this metric depend on the cop density?