8/31/21

# Assignment 1

## Please use this Word file template, follow (and retain) the instructions in gray text, and insert your work in black where indicated. Keep in mind the evaluation matrix at the end as you do the work and use it to guide what you submit. Use no more than 4 pages of 12-point text excluding figures, the gray instructions, and appendices. You can add as many as many appendices as you like. These will be read on an as-needed basis.

## The Given Problem

Go [here](https://mesa.readthedocs.io/en/master/tutorials/intro_tutorial.html#sample-model-description) to the Mesa tutorial and follow the creation of the “wealth-distribution” agents[[1]](#footnote-1). Show that you have set up the MoneyAgent and MoneyModel classes, as well as the RandomActivation scheduler, and that you can run it with every agent outputting its ID and current wealth. For this part, no explanation is required.

**Screen shot of output for #1:**

Text

Description automatically generated

## Reproducing the Model

Show, by means of a screenshot of your output, that you have successfully run the model up to the point in the tutorial that says “This outcome might be surprising. Despite the fact that all agents, on average, give and receive one unit of money every step, the model converges to a state where most agents have a small amount of money and a small number have a lot of money.” Explain why you think this is the outcome.

**Screen shot of output for #2**: Chart, histogram

Description automatically generated

**Explanation of the imbalanced outcome**: The imbalanced outcome arises because, as the prompt states, with every step, on average, each agent gives and receives one unit of money (a net gain/loss of 0). Given that they all start with 1 unit of money, it makes sense that most agents end up with either nothing or unchanged. Some of the agents get the odd statistical outcome of, for example, ending with seven units as shown above, but this would be very much against the average, and the agents cannot have negative money since once an agent has nothing, they stop giving anything away for every step until they might be given something, which locks many of them in place with nothing in the end, hence the 0 wealth tower being the largest.

In other words, since after each round, every agent gives away one unit of wealth (if they have any to spare) and the odds are 1 in however many agents have money left, once agents begin to have 0 wealth, the odds that any one agent would receive wealth decreases. This is because on round 1, there are ten chances for an agent to hit a 1 in 10 chance, however the number of chances decreases for each round. Therefore, as each round progresses less and less wealth is transferred from those who acquired it earlier, so the wealth begins to concentrate into fewer and fewer hands since there is never any new wealth generated: it is a zero sum game.

## A Fairer Model

Show the results of giving away a *proportion* of an agent’s wealth. You can parameterize this. Show this via the key code, as well as screenshots of your output for various parameter values. Explain.

**Key code**: Your response replaces this.

**Screen shot of output for #3**: Your response replaces this.

## Exploration

This part of the assignment is open-ended. We want you to explore 1-3 variations on the model that you come up with (i.e., not in the tutorial or known to you as published). For example, the effects of changing the scheduler, or of a measure of “happiness” of agents that affects their giving habits. Explain.

(1) **Description of variation 1**: Your response replaces this.

**Effect** **of variation 1**: Your response replaces this.

(2) **Description** **of variation 2**: …

# Evaluation



1. There are some number of agents. All agents begin with 1 unit of money. At every step of the model, an agent gives 1 unit of money (if they have it) to some other agent. [↑](#footnote-ref-1)