Model Questionnaire

(1) What part of your phenomenon would you like to build a model of? Make sure that the phenomenon is appropriate for an agent-based model that could be completed in the next month.

I want to study the phenomenon of income distribution and economic inequality in a system. This includes the ownership of assets, determination of wages, hierarchy in economic systems etc. It also includes complex factors regarding economic consumption, role of financial institutions, etc. However, for this assignment, I am building a simple model of production which analyses the dynamics of land, labour and capital - three essential factors for economic production.

(2) What are the principal types of agents involved in this phenomenon? Illustrate all of the agent types necessary for the model.

(3) What properties do these agents have (describe by agent type)? Describe for all agent types.

The model has three agent types.

  A. The first agent type is **workers**. These agents have the properties of
  1.   Labour (essential for economic production , inherent property)
  2. Wealth (accumulation of income from the wage given by employers)

  B. The second agent type is **owners**. These agents have the properties of
  1. Labour (essential for economic production, inherent property)
  2. Capital (essential for economic production, comes from revenue)
  3. Wealth (accumulation of income coming from revenue)

  C. The third agent type is **assets**. These agents have the property of
  1. Productivity (which enables production and leads to generation of revenue)

As this is an economic model, many other types of agents, such as financial institutions and corporations can be added. However, this model aims to analyse the phenomenon of economic production. Thus, only agents representing the interactions of land, labour, and capital are included.

(4) What actions (or behaviors) can these agents take (describe by agent type)? Describe all appropriate behaviors for all agent types.

  1. Workers give their labour to the owners. In return, they receive wages which accumulate to become wealth. A certain amount of wealth is deducted for sustaining livelihood, and excess is saved.

2. Owners take labour from workers, take their own labour and capital, and give it to the asset. In return, they receive revenue from the asset. The owners then divide this revenue into three components -
a. Capital (which is stored with the owner, and is invested back into the asset)
b. Wages (which go to the workers)
c. Wealth (which stays with the owners)

3. The asset has a certain level of productivity. Depending on this productivity, and the total amount of labour and capital received, the asset generates revenue. The asset then gives this revenue to the owners.

(5) In what kind of environment do these agents operate? Describe the basic environment type (e.g., spatial, network, featurespace, etc.) and fully describe the environment.

This model essentially, is a network model. This is because the agents (workers - business owners - assets) are linked to each other, in a clustered way. Currently, there are no connecting nodes between clusters. The model can be assembled in a spatial way, where the workers are distributed in a particular order, and create a link with the nearest business owner. The business owner then, can create a link with the nearest asset - creating a spatial aspect.

(6) If you had to "discretize" the phenomenon into time steps, what events and in what order would occur during any one time step? Fully describe everything that happens during a time step.

1. Worker agent gives their labour to the linked owner agent
2. Owner takes the labour given by all workers linked to it
3. Owner inspects their own labour and capital
4. Owner gives the total labour and capital to the asset
5. The asset takes the total labour and capital
6. Based on the productivity, labour and capital - asset generates revenue
7. Asset gives the revenue to owners
8. Owners take this revenue and divide it three ways - capital, wealth and wages
9. Owners add to their capital from the revenue.
10. Owners provide wages to all linked worker agents from the revenue
11. Owners add to their wealth from the revenue
12. Owners deduct a certain amount of wealth for sustaining livelihood.
13. Workers get their wealth from wages
14. Workers deduct a certain amount of wealth for sustaining livelihood.
15. Tick

(7) What are the inputs to the model? Identify all relevant inputs.

    A. The number of workers, owners and assets in the model
    B. The percentage of workers vs. owners in the economy
    C. Distribution of assets among the owners
    D. The distribution of revenue that goes into capital, wages and owner's wealth respectively
    E. Total wealth in the system
    F. Amount deducted from wealth to sustain livelihood

(8) What do you hope to observe from this model? Identify all relevant outputs.

    A. Distribution of wealth : Plotting the wealth of all workers and owners to see the distribution of wealth. The Gini Index can also be used to evaluate equality in the system.
    B. Revenue Generation : Plotting the revenue generated in each timestep to see the growth in the system - often characterised as the GDP of an economy.

Thank you in advance for your time and effort on this questionnaire.