**Problem Set 6A (due 11:59 pm, 3 December 2023)**

**Simulation of the Asset Exchange Model**

(a) Write a Python program to simulate the asset exchange model with the saving factors distributed according to

The number of agents is not less than 1,000.

The number of iterations is not less than 5,000.

The number of samples is not less than 5.

The wealth of each agent is initialized to 1.

(b) Construct the complementary cumulative distribution function of wealth in log-log scale. Check whether the tail of the distribution obeys the power law. If so, calculate the exponent.

(c) The following is a conversation between Alice and Bob:

Alice: Can you explain to me how wealth is distributed among the wealthier agents in your asset exchange model?

Bob: Yes, I found that among the wealthier agents of the model, if there are agents whose wealth is , then the number of agents with wealth will be reduced by a factor .

Calculate .

(d) Construct the complementary cumulative distribution function of wealth in log-linear scale among the less wealthy agents, defined as those agents with final wealth less than the initial wealth. Check whether the tail distribution obeys the exponential law. If so, calculate the exponential function.

(e) The following is the sequel to the above conversation between Alice and Bob:

Alice: How about the wealth distribution of the less wealthy agents in your asset exchange model?

Bob: Among the less wealthy agents of the model, if there are agents whose wealth is then when we consider the number of agents whose wealth is the average number of agents will be reduced by one half”.

Calculate .

(f) Pareto discovered the 80-20 rule when he studied the wealth distribution in Italy in the early 20th century, namely, 80% of the country’s wealth was owned by the wealthiest 20% of the population. Calculate the percentage of wealth owned by the wealthiest 20% of the agents in your model. (Hint: Sort the wealth data in descending order and compute the cumulative wealth as a function of the rank.)