CxSy
Agent Strategies

- No heuristics
    - Safe: always stays in stable pool
    - **Hedger: cycles through High -> Stable -> Low -> High -> ...**
    - Random: always chooses a pool randomly
    - Gambler: always stays in high pool
- Based on payoffs
    - **Hipster: chooses the pool with the least payoff so far**
    - Sheep: chooses the pool with the highest payoff so far
    - Greedy: chooses between the low and high pool based on whichever pool had less agents in it from the previous round
- Others
    - **Copycat: copies the personality of the most successful agent in the previous timestep**

Configurations (Run 3x for each)

- Varying tau
    - 0 tau
    - 10 tau
- Varying personalities
    - Safe + Random + Gambler + Hedger
        - Check how Hedger fares against agents that just stay in one pool
    - Safe + Hipster + Sheep + Greedy
        - Check how Hipster fares against other agents that base their decisions on payoffs
    - Safe + Copycat + previous 6 agents
        - Check how Copycat fares against all the other agents used in this analysis

Analysis

- What general behaviors arise in the system?

    When the system has higher tau values, agents who switch between pools a lot tend to earn less than the other types of agents, because of the higher costs they incur at each time step.

    Safe agents perform better if the value of tau is higher, as they do not incur movement costs throughout the simulation, compared to the other strategies. Their wealth always increases at a steady pace.

- How does the wealth of the agents change over time?

    With 0 tau, the wealth of the agents increases in a linear manner. However, higher tau values can cause agents to not earn any money due to the agent's strategy being reliant on switching pools too much.

- How does the diversity of strategies influence the dynamics of the system?

Agents whose decision-making is influenced by other agents in the system tend to become more complicated when there is a diverse set of agent strategies available. For example, Copycat, which is highly dependent on the behavior of the other agents, may copy several different agent personalities in one round depending on which agents are in the system at one time.

- Are there generally classes of agent behavior (say, based on what data they use, how they process it, or the agent's overall sophistication) that lead to better performance?

The most successful agent that we came up with is the Hipster agent, which goes to the pool with the least average payoff. This may seem counterintuitive, but it makes sense in the context that most of the other agents would try and go for pools with a higher payoff, which actually frees up the pools that Hipsters go to. This, in turn, causes the payoff which Hipsters receive to be much larger when they win as compared to other agents.
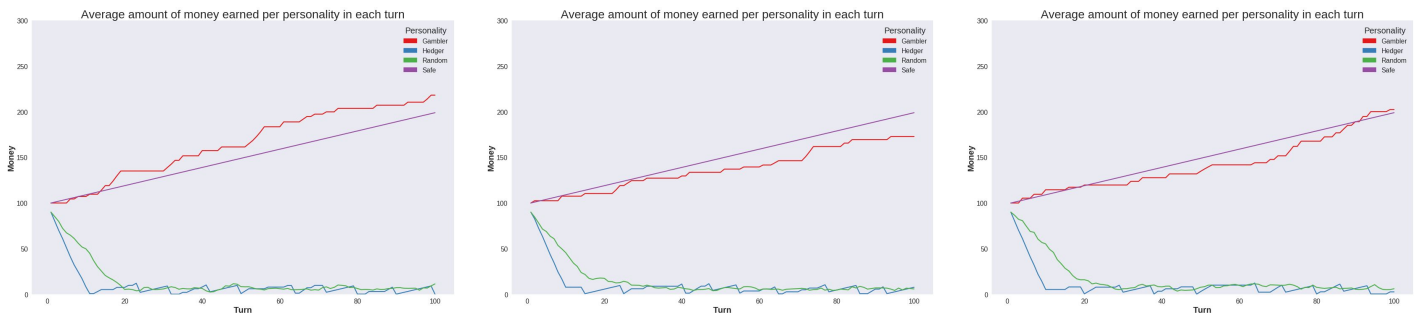
Graphs

*Safe + Random + Gambler + Hedger (0 tau)*
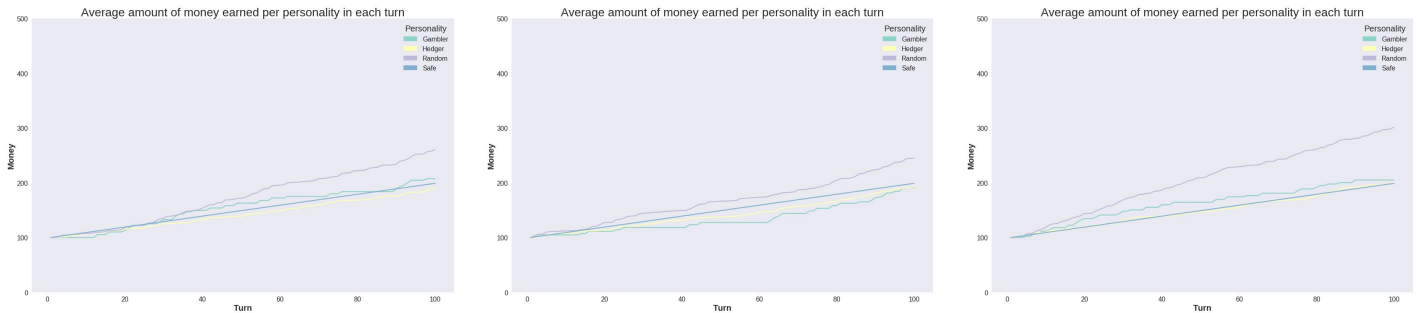
Observations: Random performs considerably better than Hedger and Gambler, whose performances are about the same as Safe's.
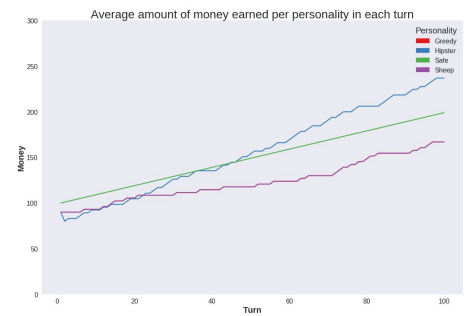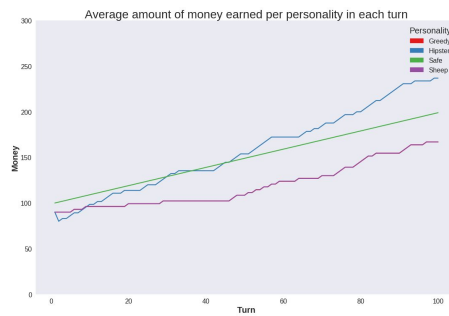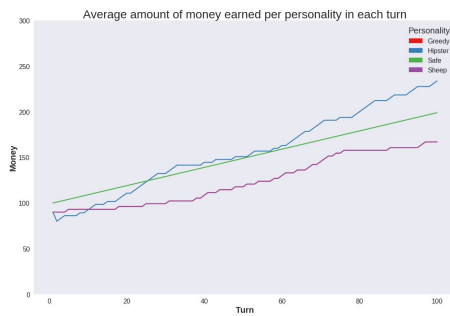
Safe + Random + Gambler + Hedger (10 tau)

Observations: Random and Hedger perform badly compared to runs with 0 tau; Gambler has inconsistent earnings in all three runs but beat all other personalities in two out of three runs
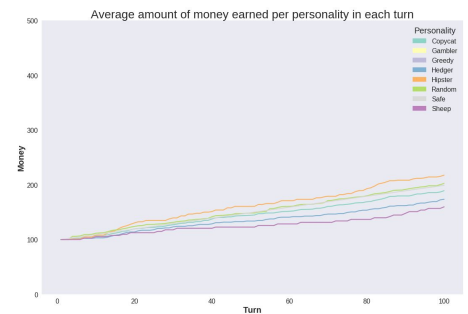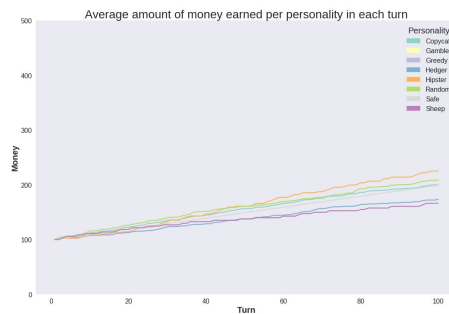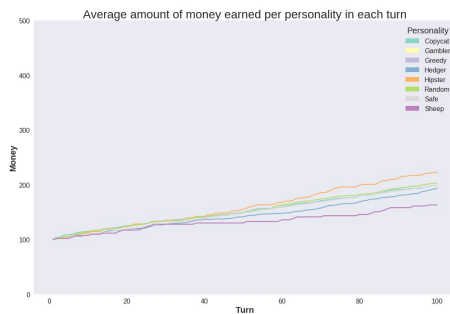
Safe + Hipster + Sheep + Greedy (0 tau)
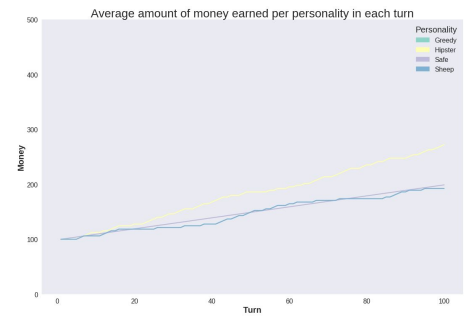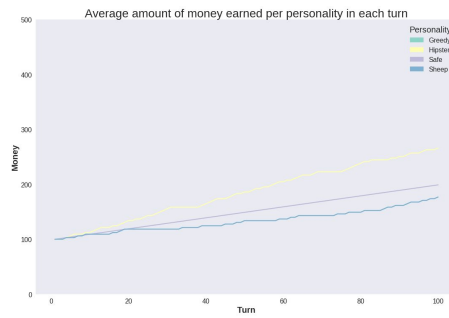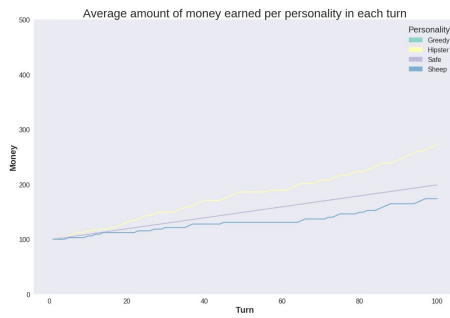
Observations: With 0 tau, it seems that Hipster performs better than the Sheep. This may be due to the fact that the Sheep follows Greedy's pool, which in turn causes the pool to become crowded, thus giving out smaller rewards
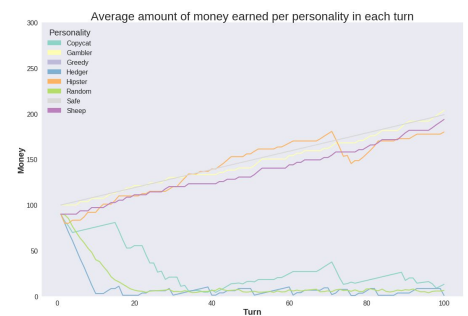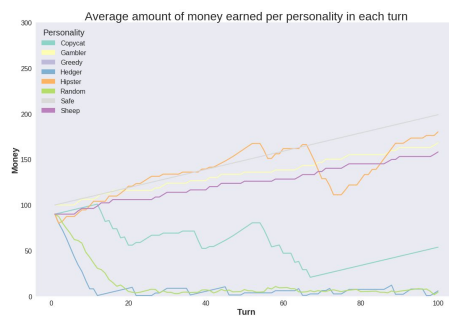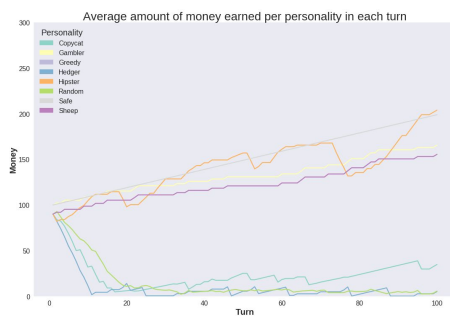
Safe + Hipster + Sheep + Greedy (10 tau)

Observations: Hipster has the highest earnings in all three tests; Sheep has the lowest earnings in all three tests

Safe + Copycat + Hipster + Sheep + Greedy + Random + Gambler + Hedger (0 tau)

Observations: With zero tau, Hipster is consistently the best model

Safe + Copycat + Hipster + Sheep + Greedy + Random + Gambler + Hedger (10 tau)

Observations: Copycat performed worse than if tau is 0; Hipster wasn't consistently the best model