Part Time Investor Strategy

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Complex Systems Individual Project
10 Option Minority Game.

1. Each Round agents pick a number between 1 and 10.

2. If they pick the minority number they receive 1 point.

3. Agents know how many people picked each number in the previous rounds, and may use this to influence their choice.
The Part Time Investor Strategy.

1. In the first round, the 100 agents each pick a number between 1 and 10 at random.
2. Before each subsequent round, the agents have a probability $\beta$ of doing a strategy evaluation.
3. In a strategy evaluation, they will check if they have won in more than 10% of the rounds since their last strategy evaluation. If this is not the case, they will change to the number that did best in the previous round.
4. If they are satisfied with how their strategy has performed, or if they did not do a strategy evaluation, they will keep their number from the previous round.
Results from the Group Project.

- Ran one trial with 50,000 rounds and $\beta = 0.02$.
- Average wealth per agent of 4440.
- On average 8.8 agents win per round.
- Theoretical maximum of 10 agents winning per round, and in random case on average 5.5 agents win per round.
Why further study?

- Similarity to strategy of part time investors on real stock market.

- If part time investors in this model are able to do so well, why are there traders in the stock market?

- Perhaps not stable.
Optimising $\beta$. 
Optimising $\beta$. 

**Standard Deviation of Average Winnings**

- **Standard Deviation**
  - 0.25
  - 0.20
  - 0.15
  - 0.10
  - 0.05
  - 0.00

- **Beta Parameter**
  - 0
  - 0.02
  - 0.04
  - 0.06
  - 0.08
  - 0.10

Graph showing the standard deviation of average winnings for different numbers of rounds (10, 50, 100, 500, 1,000, 5,000, 10,000).
Stability $\beta$ - 10 000 Rounds.
Why so stable?

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<td>Frequency</td>
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- Consider an agent who chose 3.

- They don’t have the minority number, but changing won’t help them.
Stability $\beta$ - 10 Rounds.

Stability Analysis for Beta=.001 and 10 Rounds

Average winnings

Beta Value of Player 10

Main Group

Player 100
Stability $\beta$ - 10 Rounds.
This doesn’t mean it’s stable.

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- We know about 3 people will move to 4.

- But no one will move to 5, so it will probably be the minority number in the next round.
Stability $\beta$ - 10 Rounds again.

Stability Analysis for Beta=.04, 10 Trials and agent 100 picking second best performing number.
Stability weaknesses.

- Low values of $\beta$ ultimately have higher global winnings, but are initially very predictable.

- Possible Solution: Change strategy so that $\beta$ varies in time.

- Agents only ever change to lowest ranked number, so easy to predict behavior with higher $\beta$ values.

- Possible Solution: Agents pick between least popular numbers, not just minority number.