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Homework #2: Variations on the ZI trader model

Question 3: Alter the rules by which agents form their bid and ask prices and study the effect this has on market performance. What happens when the agent population contains a mixture of ZI traders and your new agents? Alter the rules by which agents form their bid and ask prices and study the effect this has on market performance.

Explanation of variation:

In the code provided there were two variations on intelligence implemented. The first is intelligence during setup. The second is intelligence when the market runs.

The first variation on intelligence was for agents to be aware of the their neighbor's prices when they arrived at the market. This is referred to in the code as 'start location' or 'sl'. When agents find their position in the market they decide their price with some intelligence. Each agent can have two neighbors, which influence their price. If the agent arrives and it has no neighbors, it picks a random price between 1 to 30. If the agent has one neighbor, the agent beats their neighbor's price by 1 in order to offer a better value. So, sellers will adjust to 1 less than the lowest neighbor. Buyers will adjust to 1 more than the highest neighbor.

The second variation on intelligence was agents to adjust price while the market was in session. This is referred to in the code as 'adjusts value' or 'av'. If the market value was more than the agent's value, then the agent's value increased by 1. If it was less, then it decreased by 1.

Results:

In the table below, are the results for the average price and the standard deviation for 10 runs under each of the given conditions.

Variant	Average price	Standard deviation
No intelligence (all zi)	15.21	6.91
start location (awareness)	15.74	6.72
start location (awareness) w/ zero-intelligence agents	15.66	6.37
adjusts value (to market)	18.39	3.56
adjusts value (to market) w/ zero-intelligence agents	14.78	6.49

Analysis:

The zero-intelligence market had an average 15.21 and a standard deviation of 6.91. This is the base-line for the rest of our analysis. Taking into consideration, start location awareness, agents had an average price of 15.74 and a standard deviation of 6.72. This is a slightly higher average price than the control group and a slightly less standard deviation. If we add zero-intelligence agents to the mix of this variation, the average is in between the control group and the pure intelligence group. This is expected in this case, because the zero-intelligence agents dilute the group intelligence.

The experiment in start location affected the number of trades that happened. More trading occurred in the start location awareness group. The start location awareness starts the market off in a more homogenized market, which I hypothesize makes more conducive to an increased number of trades.

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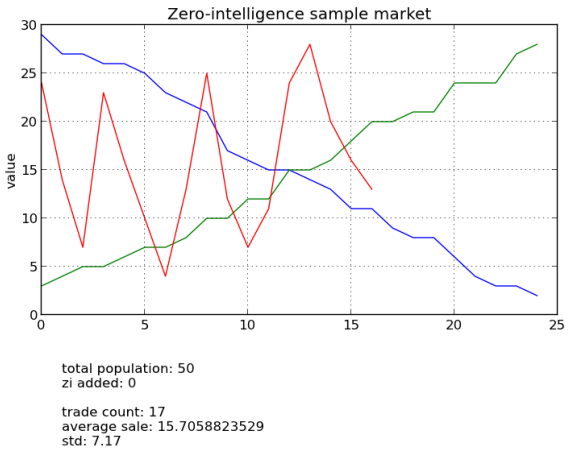
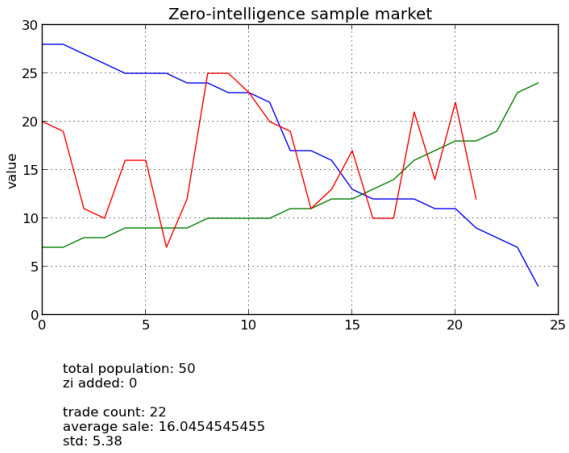
Sample run - control group:



file path = /plots/none/440.png

Sample run - start location awareness group:

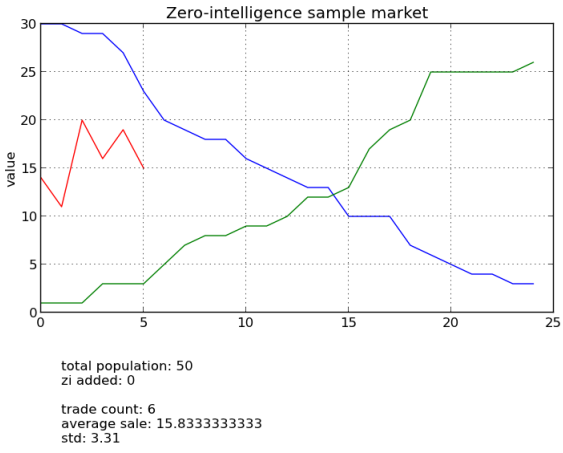


file path = /plots/sl/351.png

The variation of agents that adjust value was a bit more interesting with respect to market activity. With all agents knowing about the variations in the market, the market came to halt at a lot sooner than expected with only an average of 5.7 trades. Trades were traded at a higher average and a lower standard deviation than the control group. Agents were shut out of the market pretty quickly. See figure below.

When zero-intelligence agents were added to the intelligence agents, the market improved in the number of trades, however the average trade was lower than the control group and the intelligence group without zero-intelligence added. There wasn't much change in the standard deviation from the control group the and zero-intelligence added to adjust value variation, however it was slightly down.

Sample run - adjusts value



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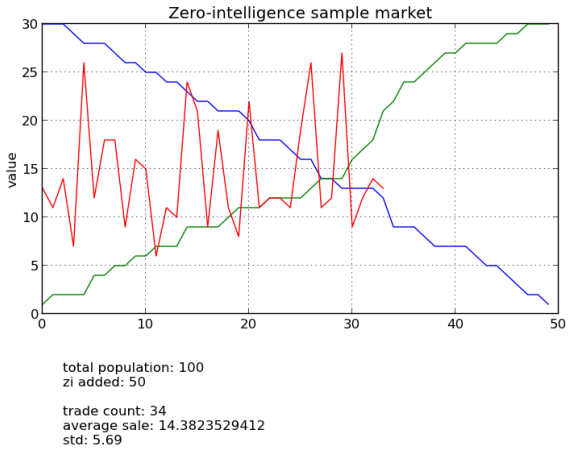
Sample run - adjusts value /w zero-int



file path = /plots/sl/372s.png