Lydia Teinfalt, 2/25/2025, HW4: Add an activation scheme to ABM and Discuss Differences
specs: Python 3x on Google Collab and Spyder

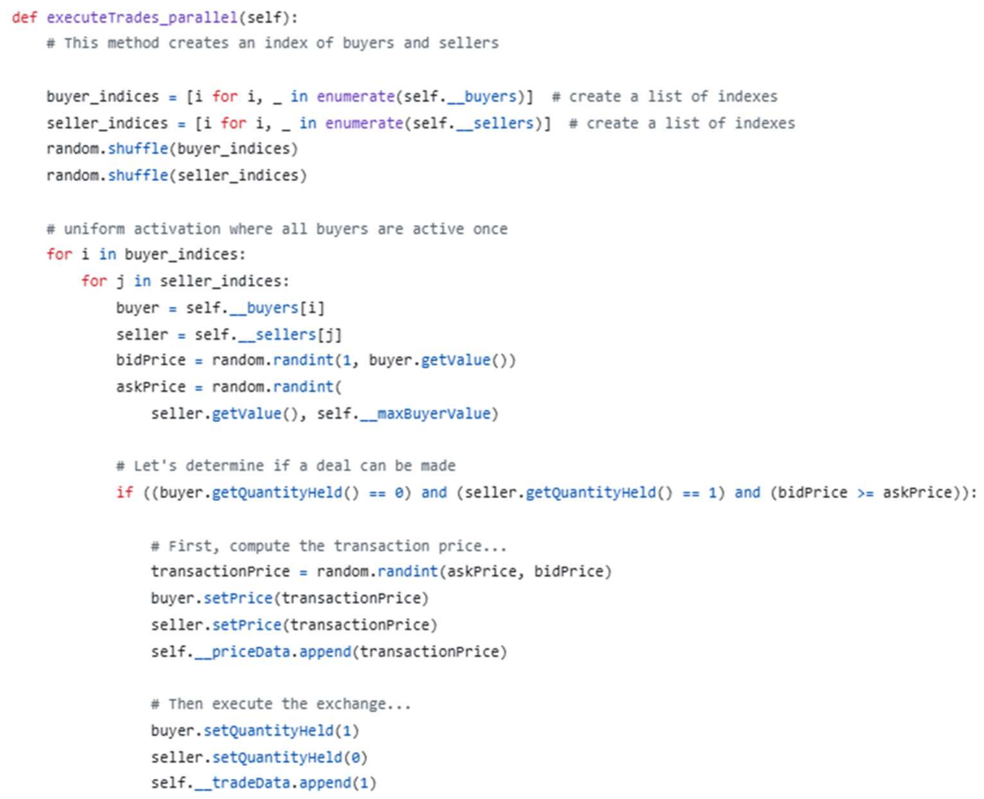
Summary (Run 1 – No New Agents, Run 2 – New Agents)

	Number of Trades	Average Price	Standard Deviation
No Activation, Run 1	27	$22.85	8.12
No Activation, Run 2	31	$25.00	10.65
Random Run 1	25	$27.64	8.46
Random, Run 2	24	$29.21	11.65

The difference with the single runs is seen in a lower number of trades overall with the Random activation versus no activation at all. However, the average price and standard deviation is higher in the runs using Random activation.

In the 35 runs, the Random activation scheme shows a higher number of trades, average price, but no change standard deviation.

executeTrades_parallel (Random activation implementation)



```
def executeTrades_parallel(self):
    # This method creates an index of buyers and sellers

    buyer_indices = [i for i, _ in enumerate(self.__buyers)]  # create a list of indexes
    seller_indices = [i for i, _ in enumerate(self.__sellers)]  # create a list of indexes
    random.shuffle(buyer_indices)
    random.shuffle(seller_indices)

    # uniform activation where all buyers are active once
    for i in buyer_indices:
        for j in seller_indices:
            buyer = self.__buyers[i]
            seller = self.__sellers[j]
            bidPrice = random.randint(1, buyer.getValue())
            askPrice = random.randint(
                seller.getValue(), self.__maxBuyerValue)

            # Let's determine if a deal can be made
            if ((buyer.getQuantityHeld() == 0) and (seller.getQuantityHeld() == 1) and (bidPrice >= askPrice)):

                # First, compute the transaction price...
                transactionPrice = random.randint(askPrice, bidPrice)
                buyer.setPrice(transactionPrice)
                seller.setPrice(transactionPrice)
                self.__priceData.append(transactionPrice)

                # Then execute the exchange...
                buyer.setQuantityHeld(1)
                seller.setQuantityHeld(0)
                self.__tradeData.append(1)
```

No Activation Scheme

ZI Traders (Baseline)

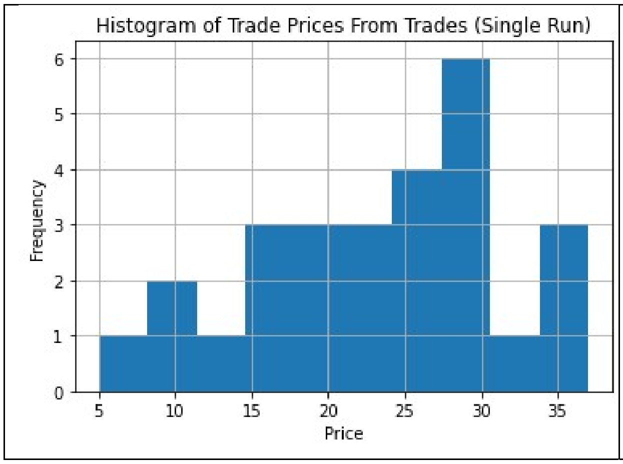
1. **First Run – No Activation Scheme**

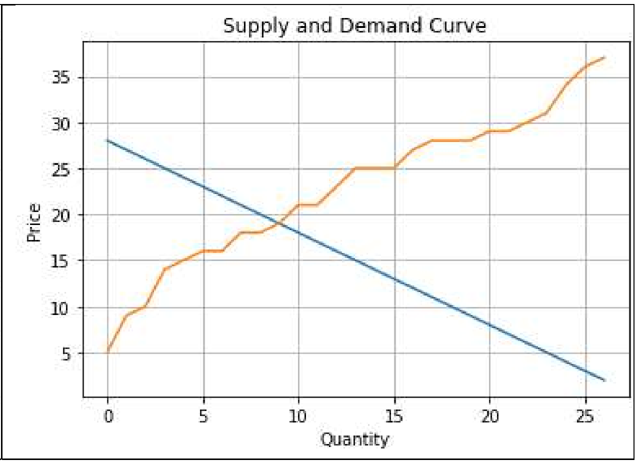
Model execution time (HH:MM:SS) is: 0:00:00.007494

Quantity traded = 27

The average price = $22.85 and the s.d. is 8.12

Number of trades in this run = 27


Histogram of Trade Prices From Trades (Single Run)


Supply and Demand Curve

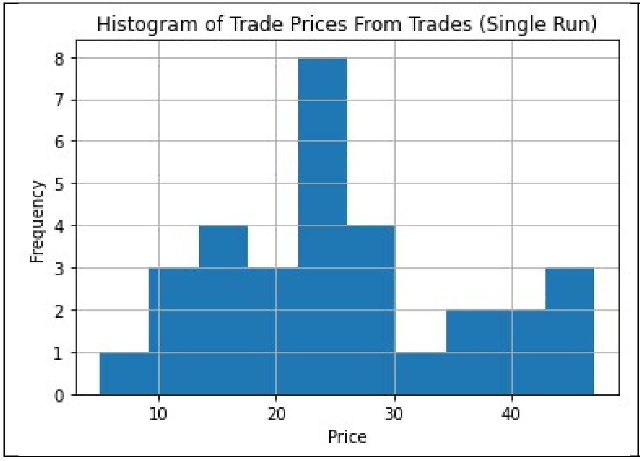
Second Run (Reset the model and then run it again using the same set of agents) – No Activation Scheme

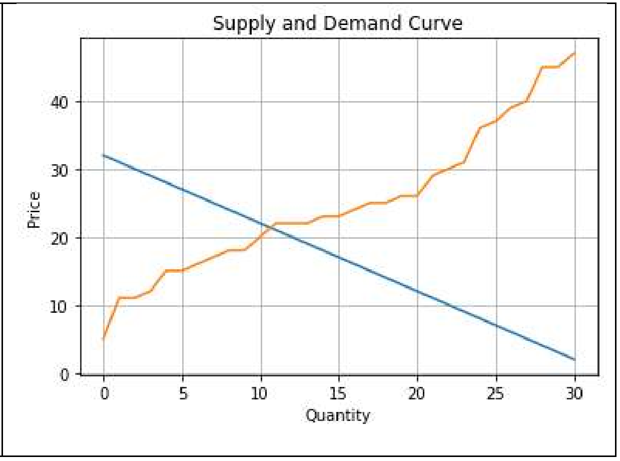
Model execution time (HH:MM:SS) is: 0:00:00.015738

Quantity traded = 31

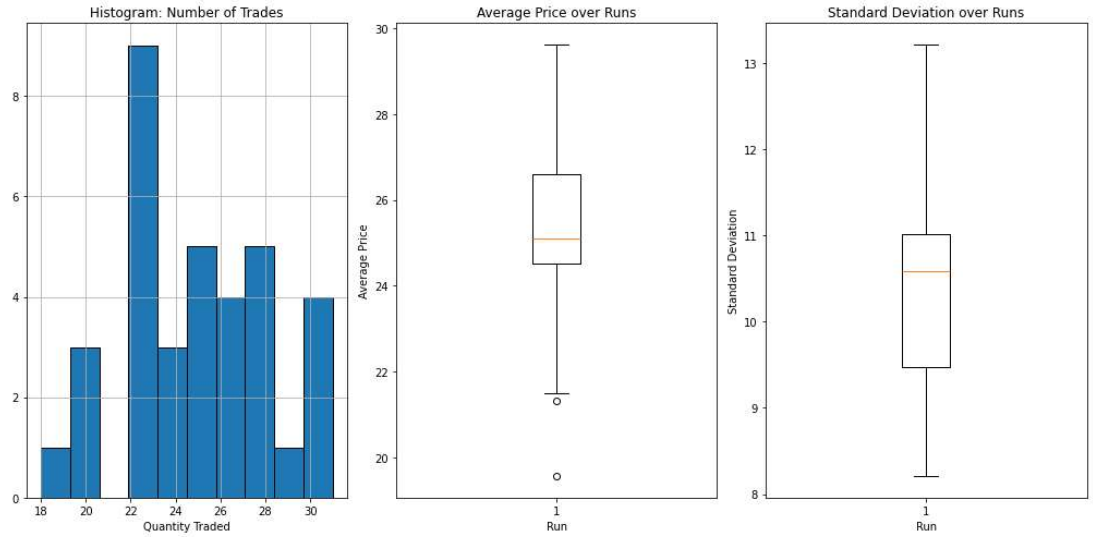
The average price = $25.00 and the s.d. is 10.65

Number of trades in this run = 31

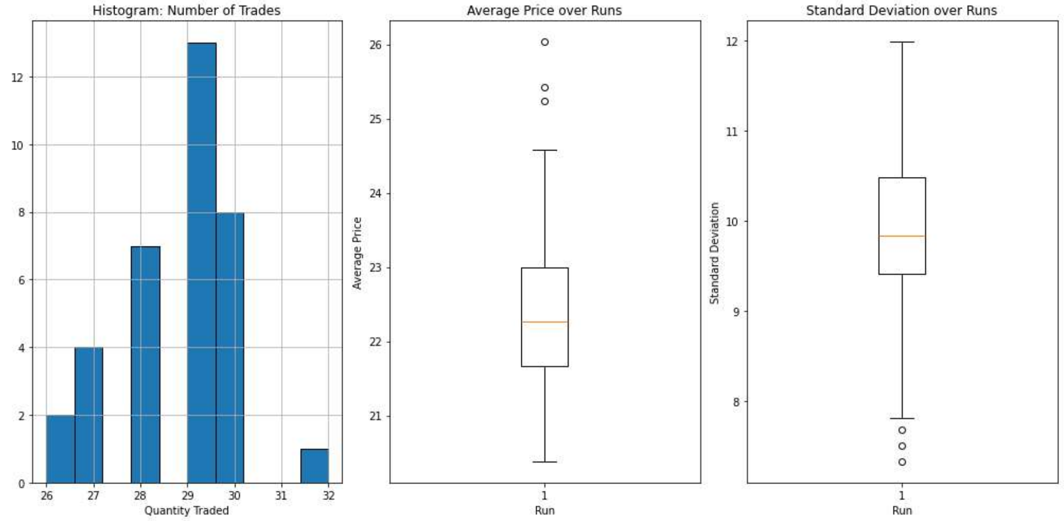

Histogram of Trade Prices From Trades (Single Run)


Supply and Demand Curve

Model Run 35 Times – After Resetting the Models and No New Agents Created After Each Run



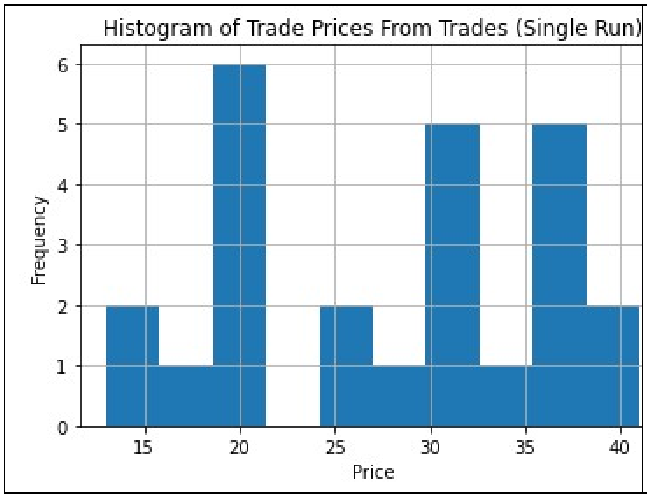
Model Run 35 Times – After Resetting the Models and **New Agents** Created After Each Run

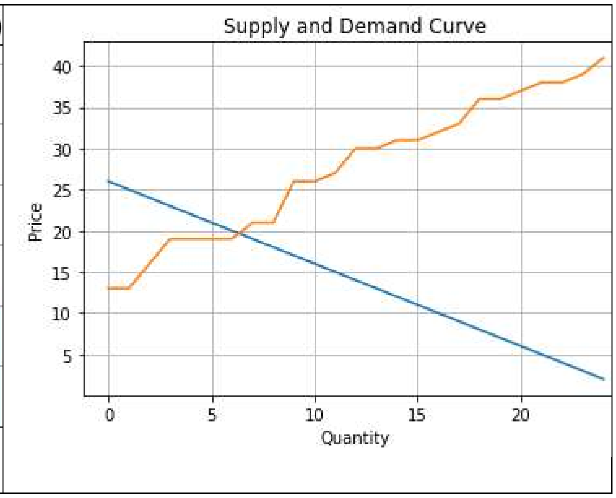


Random Activation Scheme

ZI Traders

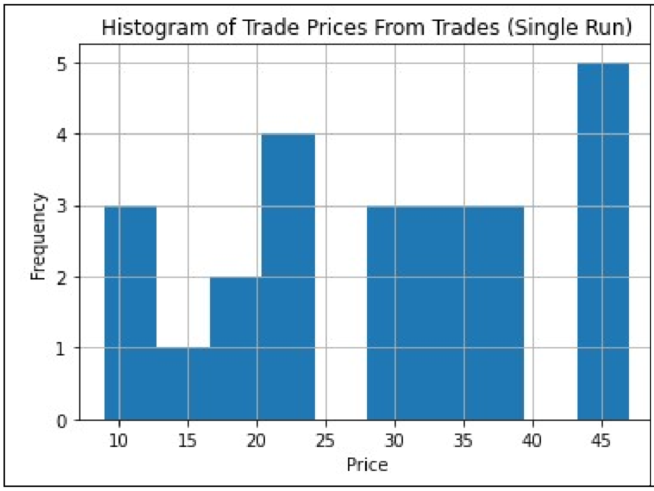
First Run – Random Activation Scheme
Model execution time (HH:MM:SS) is: 0:00:00
Quantity traded = 25
The average price = $27.64 and the s.d. is 8.46
Number of trades in this run = 25

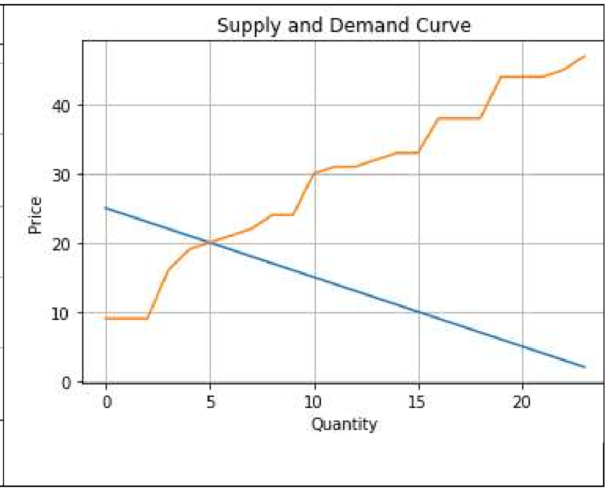




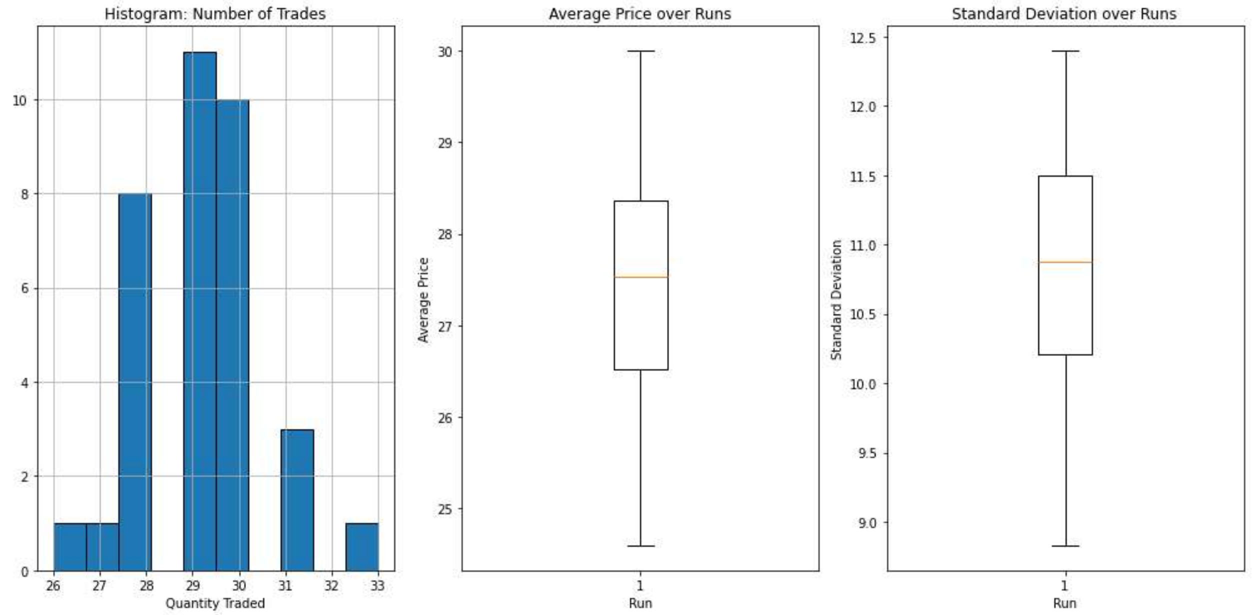
Second Run (Reset the model and then run it again using the same set of agents) – Random Activation Scheme

Model execution time (HH:MM:SS) is: 0:00:00.004355
Quantity traded = 24
The average price = $29.21 and the s.d. is 11.65
Number of trades in this run = 24

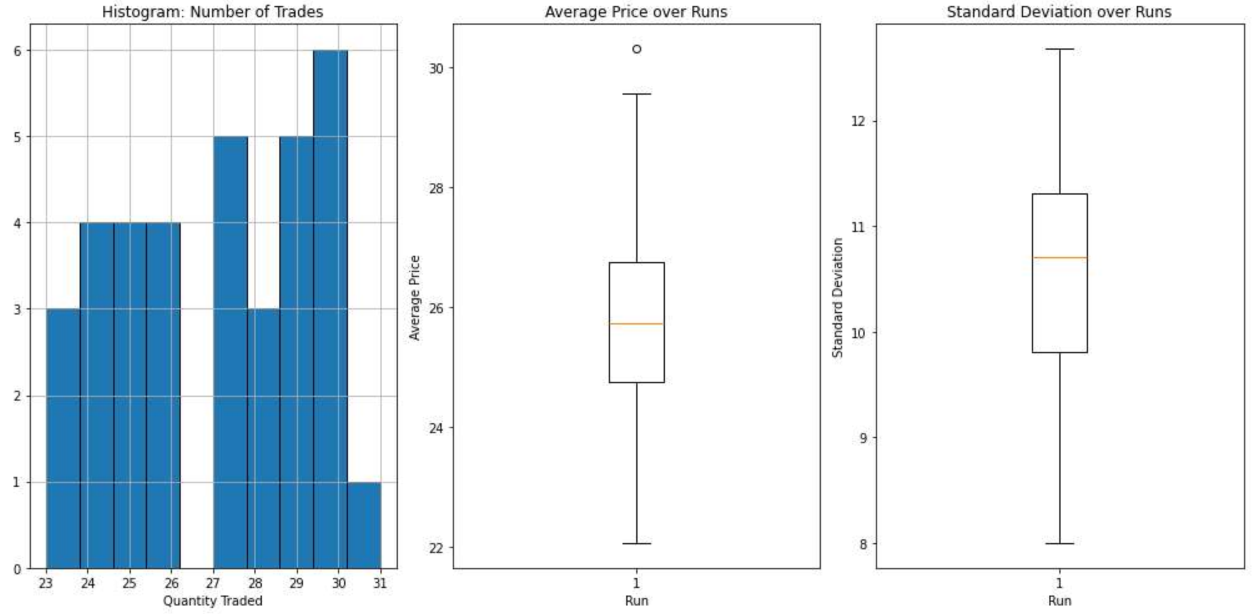




Model Run 35 Times – After Resetting the Models and No New Agents Created After Each Run – **Random Activation**



Model Run 35 Times – After Resetting the Models and **New Agents** Created After Each Run – **Random Activation**



Code Repository

https://github.com/lydiateinfalt/CSS610-AgentBasedModelingSimulation-Spring2025/blob/main/Python/ZITraders.py

https://github.com/lydiateinfalt/CSS610-AgentBasedModelingSimulation-Spring2025/blob/main/Python/ZI_RandomActivation.py