

Code Storm 2010

Background reading

- 16-17 Oct 2010

Note:

We will not be able to answer questions regarding this document before game starts. You will have a chance to ask questions on the game day.

Sneak peek

- There is a virtual fruit market in the game.
- There will be a market maker who will buy and sell fruits from each team.
- You have a chance to buy or sell with the market maker for a fixed number of virtual days (rounds).
- You will be required to write a program to send buy/sell orders to the market maker.
- You need to send your orders over the internet to the market maker.

Bid versus Offer

- Some terms we will use in the game:
 - Bid price => Price you are willing to pay to buy something
 - Offer price => Price you are willing to accept to sell something

At the start of each round:

- The market maker will publish a minimum bid price he will sell a fruit to you
 - If two teams submit different bid prices to the market maker, he will sell to the higher bid first
- The market maker will publish a maximum offer price he will buy a fruit from you
 - If two teams submit different offer prices to the market maker, he will buy from the lower offer first
- The minimum bid price is the same as the maximum offer price in each round

Offer Matching

- Orders are filled in alphabetical order by product
 - you could run out of money for Zucchini if all your bids for Apples are accepted
- Offers are **adjusted** when the **market is short**
 - i.e. when you bid more than is still available from the market maker
- Offers are **rejected** when the **player is short**
 - i.e. you offer more than you have to sell, or have cash to buy
 - or if the bid/offer does exceeds the total number of fruits available to buy/sell

Offer Matching

- In a tie situation (two bids or two offers at the same price) the team which sent its order first will win
 - Market does not consider the number of units bid or offered when resolving a tie
- Orders are settled at the end of the round
 - For example, you have N units of a fruit at the start of round X . You cannot sell more than N units of that fruit during that round, even if your submission also includes a buy order to buy more of the same fruit.
- Market activity affects market prices
 - But you are only a small portion of the whole market!

Offer Matching Example

Round starts

Player 1	
\$10.00	Cash
10	Apple

Player 2	
\$11.00	Cash
5	Apple
10	Pear

Player 3	
\$20.00	Cash
5	Apple

Offer Matching Example

Players receive supply and demand

Player 1	
\$10.00	Cash
10	Apple

Player 2	
\$11.00	Cash
5	Apple
10	Pear

Player 3	
\$20.00	Cash
5	Apple

Demand
5 Apple @ \$2.00
3 Pear @ \$3.00

Supply
5 Apple @ \$2.00
7 Pear @ \$3.00
3 Lime @ \$5.00

Offer Matching Example

Players send offers

Player 1	
\$10.00	Cash
10	Apple

Received 1st:

Sell: 2 Pear @ \$3.00
Buy: 5 Apple @ \$2.00
Buy: 2 Pear @ \$3.33

Demand
5 Apple @ \$2.00
3 Pear @ \$3.00

Player 2	
\$11.00	Cash
5	Apple
10	Pear

Received 2nd:

Sell: 1 Pear @ \$2.00
Buy: 2 Apple @ \$2.50
Buy: 3 Pear @ \$3.00

Supply
5 Apple @ \$2.00
7 Pear @ \$3.00
3 Lime @ \$5.00

Player 3	
\$20.00	Cash
5	Apple

Received 3rd:

Sell: 5 Apple @ \$1.50
Buy: 5 Apple @ \$2.00
Buy: 5 Pear @ \$4.00

Offer Matching Example

Server acknowledges offers

Player 1	
\$10.00	Cash
10	Apple

Received 1st:

Sell: 2 Pear @ \$3.00
Buy: 5 Apple @ \$2.00
Buy: 2 Pear @ \$3.33

Demand
5 Apple @ \$2.00
3 Pear @ \$3.00

Player 2	
\$11.00	Cash
5	Apple
10	Pear

Received 2nd:

Sell: 1 Pear @ \$2.00
Buy: 2 Apple @ \$2.50
Buy: 3 Pear @ \$3.00

Supply
5 Apple @ \$2.00
7 Pear @ \$3.00
3 Lime @ \$5.00

Player 3	
\$20.00	Cash
5	Apple

Received 3rd:

Sell: 5 Apple @ \$1.50
Buy: 5 Apple @ \$2.00
Buy: 5 Pear @ \$4.00

Offer Matching Example

Matching begins

Player 1	
\$10.00	Cash
10	Apple

Received 1st:

Sell: 2 Pear @ \$3.00
Buy: 5 Apple @ \$2.00
Buy: 2 Pear @ \$3.33

Demand
5 Apple @ \$2.00
3 Pear @ \$3.00

Player 2	
\$11.00	Cash
5	Apple
10	Pear

Received 2nd:

Sell: 1 Pear @ \$2.00
Buy: 2 Apple @ \$2.50
Buy: 3 Pear @ \$3.00

Supply
5 Apple @ \$2.00
7 Pear @ \$3.00
3 Lime @ \$5.00

Player 3	
\$20.00	Cash
5	Apple

Received 3rd:

Sell: 5 Apple @ \$1.50
Buy: 5 Apple @ \$2.00
Buy: 5 Pear @ \$4.00

Offer Matching Example

Lowest offer is best for matching demand

Player 1	
\$10.00	Cash
10	Apple

Received 1st:

Sell: 2 Pear @ \$3.00
Buy: 5 Apple @ \$2.00
Buy: 2 Pear @ \$3.33

Demand
5 Apple @ \$2.00
3 Pear @ \$3.00

Player 2	
\$11.00	Cash
5	Apple
10	Pear

Received 2nd:

Sell: 1 Pear @ \$2.00
Buy: 2 Apple @ \$2.50
Buy: 3 Pear @ \$3.00

Supply
5 Apple @ \$2.00
7 Pear @ \$3.00
3 Lime @ \$5.00

Player 3	
\$20.00	Cash
5	Apple

Received 3rd:

Sell: 5 Apple @ \$1.50
Buy: 5 Apple @ \$2.00
Buy: 5 Pear @ \$4.00

Offer Matching Example

Match best price for Apples

Player 1	
\$10.00	Cash
10	Apple

Received 1st:

Sell: 2 Pear @ \$3.00
Buy: 5 Apple @ \$2.00
Buy: 2 Pear @ \$3.33

Demand
5 Apple @ \$2.00
3 Pear @ \$3.00

Player 2	
\$11.00	Cash
5	Apple
10	Pear

Received 2nd:

Sell: 1 Pear @ \$2.00
Buy: 2 Apple @ \$2.50
Buy: 3 Pear @ \$3.00

Supply
5 Apple @ \$2.00
7 Pear @ \$3.00
3 Lime @ \$5.00

Player 3	
\$20.00	Cash
5	Apple

Received 3rd:

Sell: 5 Apple @ \$1.50
Buy: 5 Apple @ \$2.00
Buy: 5 Pear @ \$4.00

Offer Matching Example

Match best price for Pears

Player 1	
\$10.00	Cash
10	Apple

Received 1st:

Sell: 2 Pear @ \$3.00
Buy: 5 Apple @ \$2.00
Buy: 2 Pear @ \$3.33

Demand
0 Apple @ \$2.00
3 Pear @ \$3.00

Player 2	
\$11.00	Cash
5	Apple
10	Pear

Received 2nd:

Sell: 1 Pear @ \$2.00
Buy: 2 Apple @ \$2.50
Buy: 3 Pear @ \$3.00

Supply
5 Apple @ \$2.00
7 Pear @ \$3.00
3 Lime @ \$5.00

Player 3	
\$20.00	Cash
5	Apple

Received 3rd:

+\$7.50

-5

Sell: 5 Apple @ \$1.50
Buy: 5 Apple @ \$2.00
Buy: 5 Pear @ \$4.00

Offer Matching Example

Next-best price for Pears rejected due to lack of inventory

Player 1	
\$10.00	Cash
10	Apple

Received 1st:

~~Sell: 2 Pear @ \$3.00~~
Buy: 5 Apple @ \$2.00
Buy: 2 Pear @ \$3.33

Demand
0 Apple @ \$2.00
2 Pear @ \$3.00

Player 2	
\$13.00	Cash
5	Apple
10	Pear

Received 2nd:

+\$2.00

-1

Sell: 1 Pear @ \$2.00
Buy: 2 Apple @ \$2.50
Buy: 3 Pear @ \$3.00

Supply
5 Apple @ \$2.00
7 Pear @ \$3.00
3 Lime @ \$5.00

Player 3	
\$20.00	Cash
5	Apple

Received 3rd:

+\$7.50

-5

Sell: 5 Apple @ \$1.50
Buy: 5 Apple @ \$2.00
Buy: 5 Pear @ \$4.00

Offer Matching Example

Highest price is best to match supply

Player 1	
\$10.00	Cash
10	Apple

Received 1st:

~~Sell: 2 Pear @ \$3.00~~
 Buy: 5 Apple @ \$2.00
 Buy: 2 Pear @ \$3.33

Demand
0 Apple @ \$2.00
2 Pear @ \$3.00

Player 2	
\$13.00	Cash
5	Apple
10	Pear

Received 2nd:

+\$2.00

Sell: 1 Pear @ \$2.00
 Buy: 2 Apple @ \$2.50
 Buy: 3 Pear @ \$3.00

-1

Supply
5 Apple @ \$2.00
7 Pear @ \$3.00
3 Lime @ \$5.00

Player 3	
\$20.00	Cash
5	Apple

Received 3rd:

+\$7.50

Sell: 5 Apple @ \$1.50
 Buy: 5 Apple @ \$2.00
 Buy: 5 Pear @ \$4.00

-5

Offer Matching Example

Best match price for Apples

Player 1	
\$10.00	Cash
10	Apple

Received 1st:

~~Sell: 2 Pear @ \$3.00~~
Buy: 5 Apple @ \$2.00
Buy: 2 Pear @ \$3.33

Demand
0 Apple @ \$2.00
2 Pear @ \$3.00

Player 2	
\$13.00	Cash
5	Apple
10	Pear

Received 2nd:

+\$2.00

Sell: 1 Pear @ \$2.00
Buy: 2 Apple @ \$2.50
Buy: 3 Pear @ \$3.00

-1

Supply
5 Apple @ \$2.00
7 Pear @ \$3.00
3 Lime @ \$5.00

Player 3	
\$20.00	Cash
5	Apple

Received 3rd:

+\$7.50

Sell: 5 Apple @ \$1.50
Buy: 5 Apple @ \$2.00
Buy: 5 Pear @ \$4.00

-5

Offer Matching Example

Next-best offers are tied so fill the one received first

Player 1	
\$10.00	Cash
10	Apple

Received 1st:

~~Sell: 2 Pear @ \$3.00~~
Buy: 5 Apple @ \$2.00
Buy: 2 Pear @ \$3.33

Demand
0 Apple @ \$2.00
2 Pear @ \$3.00

Player 2	
\$13.00	Cash
5	Apple
10	Pear

Received 2nd:

+\$2.00 -\$5.00

+2

-1

Sell: 1 Pear @ \$2.00
Buy: 2 Apple @ \$2.50
Buy: 3 Pear @ \$3.00

Supply
3 Apple @ \$2.00
7 Pear @ \$3.00
3 Lime @ \$5.00

Player 3	
\$20.00	Cash
5	Apple

Received 3rd:

+\$7.50

-5

Sell: 5 Apple @ \$1.50
~~Buy: 5 Apple @ \$2.00~~
Buy: 5 Pear @ \$4.00

Offer Matching Example

Offer adjusted to match supply

Player 1	
\$10.00	Cash
10	Apple

Received 1st:

~~Sell: 2 Pear @ \$3.00~~
Buy: 3 Apple @ \$2.00
Buy: 2 Pear @ \$3.33

Demand
0 Apple @ \$2.00
2 Pear @ \$3.00

Player 2	
\$13.00	Cash
5	Apple
10	Pear

Received 2nd:

+\$2.00 -\$5.00

+2

-1

Sell: 1 Pear @ \$2.00
Buy: 2 Apple @ \$2.50
Buy: 3 Pear @ \$3.00

Supply
3 Apple @ \$2.00
7 Pear @ \$3.00
3 Lime @ \$5.00

Player 3	
\$20.00	Cash
5	Apple

Received 3rd:

+\$7.50

-5

Sell: 5 Apple @ \$1.50
~~Buy: 5 Apple @ \$2.00~~
Buy: 5 Pear @ \$4.00

Offer Matching Example

Matched best price for Pears

Player 1	
\$10.00	Cash
10	Apple

Received 1st:

-\$6.00

+3

~~Sell: 2 Pear @ \$3.00~~
Buy: 3 Apple @ \$2.00
Buy: 2 Pear @ \$3.33

Player 2	
\$13.00	Cash
5	Apple
10	Pear

Received 2nd:

+\$2.00 -\$5.00

+2

-1

Sell: 1 Pear @ \$2.00
Buy: 2 Apple @ \$2.50
Buy: 3 Pear @ \$3.00

Player 3	
\$20.00	Cash
5	Apple

Received 3rd:

+\$7.50

-5

Sell: 5 Apple @ \$1.50
~~Buy: 5 Apple @ \$2.00~~
Buy: 5 Pear @ \$4.00

Demand
0 Apple @ \$2.00
2 Pear @ \$3.00

Supply
0 Apple @ \$2.00
7 Pear @ \$3.00
3 Lime @ \$5.00

Offer Matching Example

Next-best price rejected due to lack of funds

Player 1	
\$10.00	Cash
10	Apple

Received 1st:

-\$6.00

+3

~~Sell: 2 Pear @ \$3.00~~
Buy: 3 Apple @ \$2.00
~~Buy: 2 Pear @ \$3.33~~

Demand
0 Apple @ \$2.00
2 Pear @ \$3.00

Player 2	
\$13.00	Cash
5	Apple
10	Pear

Received 2nd:

+\$2.00 -\$5.00

+2

-1

Sell: 1 Pear @ \$2.00
Buy: 2 Apple @ \$2.50
Buy: 3 Pear @ \$3.00

Supply
0 Apple @ \$2.00
2 Pear @ \$3.00
3 Lime @ \$5.00

Player 3	
\$20.00	Cash
5	Apple

Received 3rd:

+\$7.50 -\$20.00

-5

+5

Sell: 5 Apple @ \$1.50
~~Buy: 5 Apple @ \$2.00~~
Buy: 5 Pear @ \$4.00

Offer Matching Example

Next-best offer adjusted to match supply

Player 1	
\$10.00	Cash
10	Apple

Received 1st:

-\$6.00

+3

~~Sell: 2 Pear @ \$3.00~~
Buy: 3 Apple @ \$2.00
~~Buy: 2 Pear @ \$3.33~~

Player 2	
\$13.00	Cash
5	Apple
10	Pear

Received 2nd:

+\$2.00 -\$5.00

+2

-1

Sell: 1 Pear @ \$2.00
Buy: 2 Apple @ \$2.50
Buy: 2 Pear @ \$3.00

Player 3	
\$20.00	Cash
5	Apple

Received 3rd:

+\$7.50 -\$20.00

-5

+5

Sell: 5 Apple @ \$1.50
~~Buy: 5 Apple @ \$2.00~~
Buy: 5 Pear @ \$4.00

Demand
0 Apple @ \$2.00
2 Pear @ \$3.00

Supply
0 Apple @ \$2.00
2 Pear @ \$3.00
3 Lime @ \$5.00

Offer Matching Example

All possible matching complete

Player 1	
\$10.00	Cash
10	Apple

Received 1st:

-\$6.00

+3

~~Sell: 2 Pear @ \$3.00~~
 Buy: 3 Apple @ \$2.00
~~Buy: 2 Pear @ \$3.33~~

Demand
0 Apple @ \$2.00
2 Pear @ \$3.00

Player 2	
\$13.00	Cash
5	Apple
10	Pear

Received 2nd:

+\$2.00 -\$5.00 **-\$6**

+2

-1 **+2**

Sell: 1 Pear @ \$2.00
 Buy: 2 Apple @ \$2.50
 Buy: 2 Pear @ \$3.00

Supply
0 Apple @ \$2.00
0 Pear @ \$3.00
3 Lime @ \$5.00

Player 3	
\$20.00	Cash
5	Apple

Received 3rd:

+\$7.50 -\$20.00

-5

+5

Sell: 5 Apple @ \$1.50
~~Buy: 5 Apple @ \$2.00~~
 Buy: 5 Pear @ \$4.00

Offer Matching Example

Player inventories updated

Player 1	
\$4.00	Cash
13	Apple

Received 1st:

~~Sell: 2 Pear @ \$3.00~~
Buy: 3 Apple @ \$2.00
~~Buy: 2 Pear @ \$3.33~~

Demand
0 Apple @ \$2.00
2 Pear @ \$3.00

Player 2	
\$4.00	Cash
7	Apple
11	Pear

Received 2nd:

Sell: 1 Pear @ \$2.00
Buy: 2 Apple @ \$2.50
Buy: 2 Pear @ \$3.00

Supply
0 Apple @ \$2.00
0 Pear @ \$3.00
3 Lime @ \$5.00

Player 3	
\$7.50	Cash
0	Apple
5	Pear

Received 3rd:

Sell: 5 Apple @ \$1.50
~~Buy: 5 Apple @ \$2.00~~
Buy: 5 Pear @ \$4.00

Offer Matching Example

Unmet demand puts upward pressure on price

Player 1	
\$4.00	Cash
13	Apple

Received 1st:

~~Sell: 2 Pear @ \$3.00~~
Buy: **3** Apple @ \$2.00
~~Buy: 2 Pear @ \$3.33~~

Demand
0 Apple @ \$2.00
2 Pear @ \$3.00

Player 2	
\$4.00	Cash
7	Apple
11	Pear

Received 2nd:

Sell: 1 Pear @ \$2.00
Buy: 2 Apple @ \$2.50
Buy: **2** Pear @ \$3.00

Supply
0 Apple @ \$2.00
0 Pear @ \$3.00
3 Lime @ \$5.00

Player 3	
\$7.50	Cash
0	Apple
5	Pear

Received 3rd:

Sell: 5 Apple @ \$1.50
~~Buy: 5 Apple @ \$2.00~~
Buy: 5 Pear @ \$4.00

Offer Matching Example

Unwanted supply puts downward pressure on price

Player 1	
\$4.00	Cash
13	Apple

Received 1st:

~~Sell: 2 Pear @ \$3.00~~
Buy: 3 Apple @ \$2.00
~~Buy: 2 Pear @ \$3.33~~

Demand
0 Apple @ \$2.00
2 Pear @ \$3.00

Player 2	
\$4.00	Cash
7	Apple
11	Pear

Received 2nd:

Sell: 1 Pear @ \$2.00
Buy: 2 Apple @ \$2.50
Buy: 2 Pear @ \$3.00

Supply
0 Apple @ \$2.00
0 Pear @ \$3.00
3 Lime @ \$5.00

Player 3	
\$7.50	Cash
0	Apple
5	Pear

Received 3rd:

Sell: 5 Apple @ \$1.50
~~Buy: 5 Apple @ \$2.00~~
Buy: 5 Pear @ \$4.00

That's it!

- Get plenty of sleep
- See you on game day!