

Lecture 7

Trading on an LOM Exchange

We raised several areas worth attending to in our discussion of a single limit order market (the trade off between immediacy and lower price, picking off risk, and insider information). These issues are magnified when trading in a multi-market setting. This session is devoted to giving you some experience in trading simultaneously on an exchange with several markets.

Revisiting *Landing Gates*

- ◆ There are 6 airline companies. They can all buy and sell their landing gate rights.
- ◆ Each airline values owning up to two gates at some positive amount, but place no value at all on owning any more than two gates.
- ◆ An airline's valuation of its first two landing gates is drawn from a uniform distribution with minimum 10 and maximum 20.
- ◆ Every airline knows its own valuation, but not the valuations of its rivals.

Initial endowment and profit

- ◆ An airline is initially endowed with 0, 1 or 2 landing gates, with probability $1/3$ attached to each outcome.
- ◆ Every airline has an initial cash endowment of \$100 (also measured in hundreds of thousands of dollars).
- ◆ Your **initial wealth** is the sum of initial cash and valuation times number of landing gates assigned at the beginning of the game.
- ◆ The **profit** is calculated as a current wealth minus initial wealth.

Your personal quote

- ◆ Define your highest limit order buy price as your **personal bid**:
 - If you have no limit buy orders, then your personal bid is zero.
- ◆ Define your lowest limit order sell price as your **personal ask**:
 - If you have no limit sell orders, then personal ask is infinity.
- ◆ Your **personal quote** is the pair:
(personal bid, personal ask)

Rule: If your quote is continuously updated (to avoid picking off risk) to straddle your valuation, then your portfolio cannot lose value.

Trading without losses

- ◆ Summarizing, a strategy that **fully protects** you against loss is to:
 - Straddle your valuation with your personal quote (*most attractive buy and sell limit order*).
 - Place market buy order if your valuation exceeds the ask price (*cheapest limit sell order in the book*).
 - Place market sell order if your valuation is less than the bid price (*most expensive limit buy order in the book*).
- ◆ These guidelines to trading are incomplete; they do not prescribe:
 - how tightly to straddle your valuation; *tighter quotes increase the number of transactions but reduce the net gain on any given trade*.
 - favors market orders over limit orders; *placing market orders increases trading volume at the expense of a lower net gain per transaction*.
- ◆ The guidelines are also based on the premise that trading strategies entailing even a small prospect of loss are unacceptable.

Exhausting the gains from trade

- ◆ There are two ways of using a limit order market to increase the value of the allocation of assets . . .

- ◆ **Create liquidity** by placing limit orders (adding to the book):
 - with a quote that straddles your valuation.

- ◆ **Dissolve liquidity** by filling limit orders (enlarging the spread):
 - when the bid is less than your valuation (placing market buy orders)
 - or the ask is greater than your valuation (placing market sell orders).

- ◆ Suppose all bidders place a profitable:
 1. market order if that is feasible.
 2. limit order if not.

⇒ if the limit orders are placed sufficiently close to the valuation (so the personal bid and ask are nearly equal) then trading allocates all the resources to their highest value.

- ◆ But as a practical matter traders expose themselves to the prospect of loss.

Trading window before all subjects login

1. In each session six subjects must login before any of them see the instructions and a trading window.
2. Information about the number of subjects waiting to start the game is shown at the bottom left corner.

ComLabGames

Username: Ari Id: 18 Identity:

History

Name

View more history

Limit order book

Price	Quantity	Cumulative	Player id	Player type
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Cash Duration 600 Price 0 Quantity 1 Sell Buy

Summary data

Asset name	Valuation	Endowment	Sell orders	Buy orders	Bid (Quantity)	Ask (Quantity)	Trading price (Quantity)
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Subject's own limit orders

Price	Quantity	Revenue\Cost	Duration
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Transaction history

Price	Quantity	Buyer ID	Buyer T...	Seller ID	Seller T...	Time
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Waiting 5 of 6 subjects to start a session!

Round:

Trading Exchanges

- ◆ Day traders typically buy and sell on more than one security at a time.
- ◆ One list of the World's 10 most famous traders of all time reads: George Soros, Jim Rogers, Richard Dennis, Paul Tudor Jones, John Paulson, Steven Cohen, David Tepper, Nick Leeson (caused the collapse of Barings Bank).
- ◆ Typically day traders fold their position at the end of each “trading day” to avoid exposure overnight to adverse movements in their portfolio.
- ◆ This is a very competitive business, and novices run the extreme risk of losing money and sleep.
- ◆ Disciplined retirees enjoy the challenge, have the time, and sometimes quite well suited to this occupation.

Recycling

- ◆ Imagine you are one of about 40 firms in the recycling business.
- ◆ There are four product markets
 1. Plastics
 2. Metals
 3. Glass
 4. Paper
- ◆ Your upstream collectors have endowed you with 10 units of each product. You also have \$400 of liquid assets (cash) for trading in these four product markets.

Valuations

- ◆ You have also developed a network of clients that will buy all your stock at the end of the garbage collection/disposal period, say a week.
- ◆ At the end of the week you dispose of all your recycled material a unit (product specific) price or value that is given to you at the beginning of the game.
- ◆ Let's call the unit value of plastic units $V(\text{Plastic})$, and so on for the others. You sell each unit of plastic you own at $V(\text{Plastic})$ at the end of the week, and so on.
- ◆ Your values are independently drawn from a uniform distribution with support $[0,10]$.
- ◆ For example, if you draw $V(\text{Plastic}) = 9$ but $V(\text{Metal}) = 1$, then acquiring plastic is much more valuable than acquiring metal.

Value of the firm

- ◆ The initial value of your firm is:

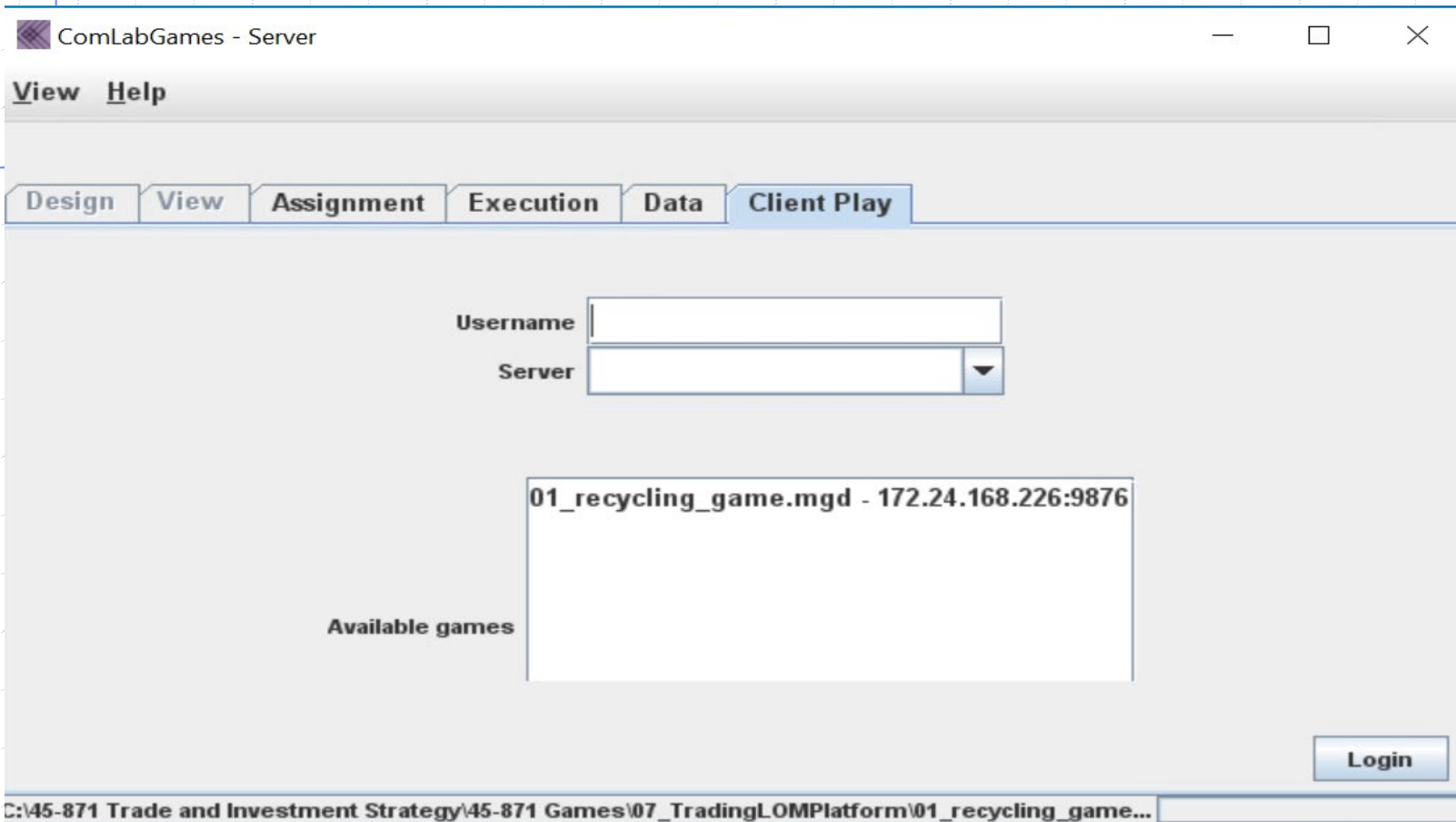
$$\text{Cash} + 10 * [V(\text{Plastic}) + V(\text{Metal}) + V(\text{Glass}) + V(\text{Paper})]$$

- ◆ Your aim is to maximize the value of your firm at the end of the collection/disposal week.
- ◆ Let's call the units of plastic you have at the end of the game $Q(\text{Plastic})$. The value of your firm at the end of the collection/disposal period is:

$$\text{Cash} + V(\text{Plastic}) Q(\text{Plastic}) + V(\text{Metal}) Q(\text{Metal}) + V(\text{Glass}) Q(\text{Glass}) + V(\text{Paper}) Q(\text{Paper})$$

Login Instructions

1. Click on Client Play
2. Click on Available games: "01_recycling_game.mgd"



The screenshot shows a window titled "ComLabGames - Server" with standard Windows window controls. Below the title bar is a menu bar with "View" and "Help". A tabbed interface contains five tabs: "Design", "View", "Assignment", "Execution", "Data", and "Client Play", with "Client Play" being the active tab. The main area of the "Client Play" tab contains a "Username" text box, a "Server" dropdown menu, and a list box labeled "Available games" which contains the entry "01_recycling_game.mgd - 172.24.168.226:9876". A "Login" button is located in the bottom right corner. The taskbar at the bottom shows the active window path: "C:\45-871 Trade and Investment Strategy\45-871 Games\07_TradingLOMPlatform\01_recycling_game..."

ComLabGames - Server

View Help

Design View Assignment Execution Data Client Play

Username

Server

Available games

01_recycling_game.mgd - 172.24.168.226:9876

Login

C:\45-871 Trade and Investment Strategy\45-871 Games\07_TradingLOMPlatform\01_recycling_game...

Continuing Login Instructions

1. Server address: 172.24.168.226 will appear automatically after selecting "01_recycling_game". If not type 172.24.168.226 in  .
2. Write a username.
3. Click on "Login".



The screenshot shows the 'ComLabGames - Server' application window. The title bar includes the application name and standard window controls. Below the title bar is a menu bar with 'View' and 'Help'. A tabbed interface is present with tabs for 'Design', 'View', 'Assignment', 'Execution', 'Data', and 'Client Play', with 'Client Play' currently selected. The main area contains a 'Username' field with the text 'Ari' and a 'Server' dropdown menu showing '172.24.168.226:9876'. Below these is a list of 'Available games' with one entry: '01_recycling_game.mgd - 172.24.168.226:9876'. A 'Login' button is located in the bottom right corner. The status bar at the bottom displays the file path: 'C:\45-871 Trade and Investment Strategy\45-871 Games\07_TradingLOMPlatform\01_recycling_game...'.

ComLabGames - Server

View Help

Design View Assignment Execution Data Client Play

Username Ari

Server 172.24.168.226:9876

01_recycling_game.mgd - 172.24.168.226:9876

Available games

Login

C:\45-871 Trade and Investment Strategy\45-871 Games\07_TradingLOMPlatform\01_recycling_game...

Trading window before all subjects login

1. In each session sixteen subjects must login before any of them see a trading window.
2. Information about the number of subjects waiting to start the game is shown at the bottom left corner.

ComLabGames

Username: Ari Id: 12 Identity:

History

Name

[View more history](#)

Limit order book

Price	Quantity	Cumulative	Player id	Player type
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Cash | Duration: 600 | Price: 0 | Quantity: 1 | [Sell](#) | [Buy](#)

Summary data

Asset name	Valuation	Endowment	Sell orders	Buy orders	Bid (Quantity)	Ask (Quantity)	Trading price (Quantity)
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Subject's own limit orders

Price	Quantity	Revenue\Cost	Duration
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Transaction history

Price	Quantity	Buyer ID	Buyer Type	Seller ID	Seller Type	Time
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Waiting 15 of 16 subjects to start a session!

Round:

Trading window

1. To trade in a specific market like "Paper", click on that market (i.e. Paper).
2. The selected market is highlighted in blue in "Summary data".

ComLabGames

Username: Clara Id: 19 Identity: 3

Plastics

History

Name	19:20:19 (27)	19:20:18 (28)
Total Asset Value	718.61	0
Difference	0	0
Plastics	9.16	9.16

Limit order book

Price	Quantity	Cumulative	Player id	Player type
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You know that you are trading in Plastic market if $V(\text{Plastics})$ appears in History and matches the Plastics valuation in summary.

View more history

Cash 400 Duration 600 Price 0 Quantity 1 Sell Buy

Summary data

Asset name	Valuation	Endowment	Sell orders	Buy orders	Bid (Quantity)	Ask (Quantity)	Trading price (Quantity)
Plastics	9.16	10					
Metals	8.21	10					
Glass	9.14	10					
Paper	5.35	10					

Subject's own limit orders

Price	Quantity	Revenue/Cost	Duration
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Transaction history

Price	Quantity	Buyer ID	Buyer Type	Seller ID	Seller Type	Time
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Plastic market is selected.

Player type:Firm (3)

Round: 1

ComLabGames

Username: Clara Id: 19 Identity: 3

Paper

History

Name	19:20:19 (152)	19:20:18 (153)
Total Asset Value	718.61	0
Difference	0	0
Paper	5.35	5.35

Limit order book

Price	Quantity	Cumulative	Player id	Player type
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$V(\text{Paper}) = 5.35$ in History matches $V(\text{Paper})$ in summary

View more history

Cash 400 Duration 600 Price 0 Quantity 1 Sell Buy

Summary data

Asset name	Valuation	Endowment	Sell orders	Buy orders	Bid (Quantity)	Ask (Quantity)	Trading price (Quantity)
Plastics	9.16	10					
Metals	8.21	10					
Glass	0.44	10					
Paper	5.35	10					

Subject's own limit orders

Price	Quantity	Revenue/Cost	Duration
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Transaction history

Price	Quantity	Buyer ID	Buyer Type	Seller ID	Seller Type	Time
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Paper market was selected.

Player type:Firm (3)

Submit a price/quantity in a specific market

1. Select the market you want to trade in.
2. Type a price and quantity, and then click  to sell and  to buy.
3. The limit order book shows outstanding limit orders for a specific market.

ComLabGames

Username: Ar Id: 18 Identity: 2

Plastics

History

Name	19:20:19 (2...	19:20:18 (2...
Total Asset Value	663.36	0
Difference	0	0
Plastics	2.53	2.53

Submitted sell order in Plastics market

Limit order book

Price	Quantity	Cumulative	Player id	Player type
5	2	0	18	Firm (2)

Cash 400 Duration 600 Price 5 Quantity 2  

Summary data

Asset name	Valuation	Endowment	Sell orders	Buy orders	Bid (Quantity)	Ask (Quantity)	Trading price (Quantity)
Plastics	2.53	8	2 (10)			5 (2)	
Metals	6.93	10					
Glass	7.57	10					
Paper	9.31	10					

Subject's own limit orders

Price	Quantity	Revenue\Cost	Duration
5	2	10	582

Transaction history

Price	Quantity	Buyer ID	Buyer Ty...	Seller ID	Seller Ty...	Time
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Player type:Firm (2)

Round: 1

ComLabGames

Username: Clara Id: 19 Identity: 3

Paper

History

Name	19:20:19 (24...	19:20:18 (24...
Total Asset Value	718.61	0
Difference	0	0
Paper	5.35	5.35

Submitted buy order in Paper market

Limit order book

Price	Quantity	Cumulative	Player id	Player type
6	3	0	19	Firm

Cash 382 Duration 600 Price 6 Quantity 3  

Summary data

Asset name	Valuation	Endowment	Sell orders	Buy orders	Bid (Quantity)	Ask (Quantity)	Trading price (Quantity)
Plastics	9.16	10	0 (0)			5 (2)	
Metals	8.21	10					
Glass	9.14	10					
Paper	5.35	10	3 (18)	6 (3)			

Subject's own limit orders

Price	Quantity	Revenue\Cost	Duration
6	3	18	584

Transaction history

Price	Quantity	Buyer ID	Buyer Type	Seller ID	Seller Type	Time
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Player type:Firm (3)

Round: 1

Trading window description

1. Limit order book shows all outstanding sell orders in red and all outstanding buy orders in green.
2. Summary data shows the bid (ask) in green (red).

ComLabGames

Username: Manuel Id: 17 Identity: 1

All valuation drawn from $U(0,10)$ in each market

History

Name	19:20:19 (7...)	19:20:18 (7...)
Total Asset Value	519.38	0
Difference	0	0
Paper	0.52	0.52

View more history

Limit order book

Price	Quantity	Cumulative	Player id	Player type
7.2	2	0	17	Firm (1)
7	3	2	19	Firm (3)
6.1	4	5	17	Firm (1)
5	3	0	18	Firm
3.6	1	3	18	Firm
0.3	2	4	17	Firm

Sell orders show total outstanding quantity submitted by a subject and in the brackets, total value of all subject's (Manuel's) sell orders. There are six sell orders for \$38.8.

Buy orders show total outstanding buy orders, which is 2 for. Total value of all submitted buy orders is \$0.6 and is written in brackets.

Cash 399.4 Duration 600 Price 0.3 Quantity 2 Sell Buy

Summary data

Asset name	Valuation	Endowment	Sell orders	Buy orders	Bid (Quantity)	Ask (Quantity)	Trading price (Quantity)
Plastics	0.78	10					5 (2)
Metals	1.72	10					
Glass	8.92	10					
Paper	0.52	4	6 (38.8)	2 (0.6)	5 (3)	6.1 (4)	

Subject's own limit orders

Price	Quantity	Revenue/Cost	Duration
7.2	2	14.4	577
6.1	4	24.4	560
0.3	2	0.6	588

To delete an order click on "x". In our example sell limit order for 6.1 and q=4 was deleted

Transaction history

Price	Quantity	Buyer ID	Buyer Ty...	Seller ID	Seller Ty...	Time
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Player type: Firm (1)

Round: 1

ComLabGames

Username: Manuel Id: 17 Identity: 1

History

Name	19:20:19 (7...)	19:20:18 (7...)
Total Asset Value	519.38	0
Difference	0	0
Paper	0.52	0.52

View more history

Limit order book

Price	Quantity	Cumulative	Player id	Player type
7.2	2	0	17	Firm (1)
7	3	2	19	Firm (3)
5	3	0	18	Firm
3.6	1	3	18	Firm
0.3	2	4	17	Firm

Difference = updated asset value after a trade - previous total asset value

Cash 399.4 Duration 600 Price 0.3 Quantity 2 Sell Buy

Summary data

Asset name	Valuation	Endowment	Sell orders	Buy orders	Bid (Quantity)	Ask (Quantity)	Trading price (Quantity)
Plastics	0.78	10					5 (2)
Metals	1.72	10					
Glass	8.92	10					
Paper	0.52	4	8	2 (14.4)	2 (0.6)	5 (3)	7 (3)

Subject's own limit orders

Price	Quantity	Revenue/Cost	Duration
7.2	2	14.4	499
0.3	2	0.6	511

Transaction history

Price	Quantity	Buyer ID	Buyer Ty...	Seller ID	Seller Ty...	Time
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Player type: Firm (1)

Trading

1. To buy/sell directly select the best order by clicking on the price of the order and click **Buy** / **Sell**.
2. Summary data and Transaction history show the executed order.

ComLabGames

Username: Ari Id: 18 Identity: 2

Paper

History

Name	20:27:27 (1..	19:20:18 (1..	19:20:18 (1..
Total Asset Val...	668.3	663.36	0
Difference	4.94	0	0
Paper	9.31	9.31	9.31

Limit order book

Price	Quantity	Cumulative	Player id	Player type
7	3	0	19	Firm (3)
5	3	3	18	Firm
3.6	1	3	18	Firm

Price \$7 was selected and by clicking on the price at which buy order is executed is \$7 (i.e. the highest outstanding sell limit order price)

Buy

View more history

Cash 391.4 Duration 800,000 Price 7 Quantity 3 Sell Buy

Summary data

Asset name	Valuation	Endowment	Sell orders	Buy orders	Bid (Quantity)	Ask (Quantity)	Trading price (Quantity)
Plastics	2.53	8					5 (2)
Metals	6.93	10					
Glass	7.57	10					
Paper	9.31	10	0 (0)	4 (18.6)	5 (3)	7 (3)	

Subject's own limit orders

Price	Quantity	Revenue\Cost	Duration
5	3	15	787842 x
3.6	1	3.6	787863 x

Transaction history

Price	Quantity	Buyer ID	Buyer Ty..	Seller ID	Seller Ty..	Time
7	3	18	Firm (2)	19	Firm (3)	00:29:16

Player type:Firm (2)

Round: 1

ComLabGames

Username: Ari Id: 18 Identity: 2

Paper

History

Name	00:29:17 (7)	20:27:27 (1..	19:20:18 (1..
Total Asset Val...	675.23	668.3	663.36
Difference	11.86	4.94	0
Paper	9.31	9.31	9.31

Limit order book

Price	Quantity	Cumulative	Player id	Player type
5	3	0	18	Firm
3.6	1	3	18	Firm

View more history

Cash 370.4 Duration 800,000 Price 7 Quantity 3 Sell Buy

Summary data

Asset name	Valuation	Endowment	Sell orders	Buy orders	Bid (Quantity)	Ask (Quantity)	Trading price (Quantity)
Plastics	2.53	8					5 (2)
Metals	6.93	10					
Glass	7.57	10					
Paper	9.31	13		4 (18.6)	5 (3)	7 (3)	

Subject's own limit orders

Price	Quantity	Revenue\Cost	Duration
5	3	15	787801 x
3.6	1	3.6	787823 x

Transaction history

Price	Quantity	Buyer ID	Buyer Ty..	Seller ID	Seller Ty..	Time
7	3	18	Firm (2)	19	Firm (3)	00:29:16

Player type:Firm (2)

Round: 1

Trading in a different market

1. Summary data shows last trading price(quantity) for each market.
2. Transaction history shows all transactions for the selected market (in our example it shows "Glass" market)

ComLabGames

Username: Clara Id: 19 Identity: 3

Glass

History

Name	08:37:56 (25)	00:29:17 (29...)	20:27:27 (43...)
Total Asset Value	750.73	737.03	732.09
Difference	32.13	18.43	13.49
Glass	9.14	9.14	9.14

View more history

Limit order book

Price	Quantity	Cumulative	Player id	Player type
7.3	1	0	20	Firm (4)
6	2	0	17	Firm
5	6	2	19	Firm
4.1	3	8	18	Firm

Cash 345 Duration 80,000 Price 6.4 Quantity 5 Sell Buy

Summary data

Asset name	Valuation	Endowment	Sell orders	Buy orders	Bid (Quantity)	Ask (Quantity)	Trading price (Quantity)
Plastics	9.16	13					5 (2)
Metals	8.21	10					
Glass	9.14	15	0 (0)	6 (30)	6 (2)	7.3 (1)	6.4 (5)
Paper	5.35	7		0 (0)	5 (3)		7 (3)

Subject's own limit orders

Price	Quantity	Revenue/Cost	Duration	
5	6	30	79634	x

Transaction history

Price	Quantity	Buyer ID	Buyer Type	Seller ID	Seller Type	Time
6.4	5	19	Firm (3)	20	Firm (4)	08:37:56

Player type:Firm (3)

Round: 1

Price \$6.4 and quantity 5 was selected and by clicking on **Buy**, buyer (id = 19) bought glass from seller id = 20. Her cash decreased to \$345. Her current total asset value is $\$750.73 = 370 + 9.16 \cdot 13 + 8.21 \cdot 10 + 9.14 \cdot 15 + 7 \cdot 5.35$.

Summary page for trading game

ComLabGames - Client

Username: Simone Id: 20 Identity: 4

Player ID	Final Total Asset Value	Initial Total Asset Value	Difference	Q(Plastics)	Q(Metal)	Q(Glass)	Q(Paper)
17	519.38	519.38	0	10	10	10	10
18	675.23	663.36	11.86	8	10	10	13
19	752.57	718.61	33.97	13	10	16	7
20	611.62	599.47	12.15	9	10	4	10

Market

Stage time limit: unlimited

Round: 1

Continue

Player type:Firm (4)

Game is over!