

# Users Guide to TraderEx A Trading and Market Structure Simulation

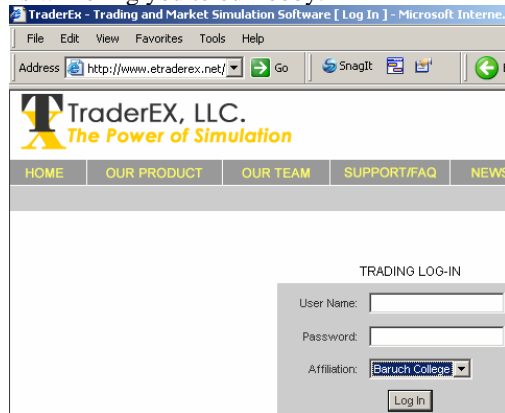
April 18, 2008

TraderEx is a trading simulation that allows participants to understand better how prices are set and trading occurs in the financial markets. The simulation lets participants either singly or in a multi-participant, networked environment, enter orders into a market that is also driven by machine generated order flow. This document familiarizes you with the TraderEx software. This is how you log on.

Go to [www.etraderex.net](http://www.etraderex.net) and click on Member Log-In



Enter your Log-In details. This will bring you to our lobby.



**The TraderEx Environment**

TraderEx provides four different trading mechanisms: an order book market, a dealer market, a call auction, and a “dark” liquidity pool.

The simulation allows only market and limit orders. There are no explicit costs (e.g., commissions) or short selling constraints. There is no negotiation among participants. You have two assets: a security and cash. You will generally begin with a zero position in both the security and in cash.

New trading orders in the simulation are both machine-generated and live user-generated. The market background is computer-generated, but the actions of you and the other networked players using the simulation will influence the orders that the computer generates and the evolution of quotes and prices as a simulation run progresses.

Price changes are not a pure random walk – they will include realistic patterns of runs (trends) and reversals (reversion). Remember, your trading will impact the market. A large buy order can drive the market up, and a large sell order can drive it down.

Simulations are run with a starting scenario number, which is a random number seed. A simulation can be rerun with the same random seed number but, by using different strategies, you will see different results.

The computer:

1. Generates a flow of machine generated public orders
2. Establishes and maintains the limit order book
3. Generates orders for a market maker participant to execute
4. Maintains a screen display, including trade history
5. Captures data for post game analysis

A training version of TraderEx can be played by an individual at the pace he chooses. In a networked group, the simulation runs in a *continuous time mode* at a slow, medium or fast rate chosen by the administrator. At a medium rate, a one trading day simulation should take about 45-60 minutes to run.

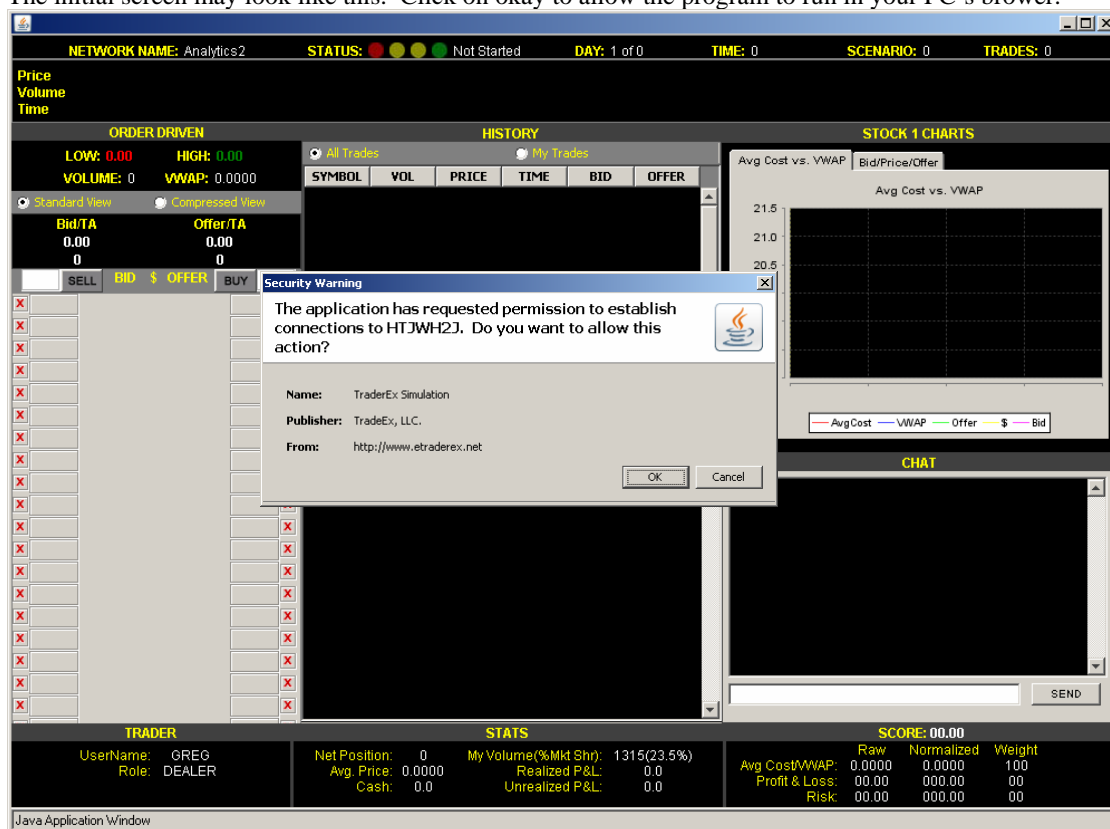
**Running TraderEx**

The administrator will tell you which network to join and in what role you will join as. In the first network below “OrderBookToCall,” the user will join as an Equity Trader by clicking the JOIN button.

The screenshot shows the TraderEx web interface. At the top left is the logo "TraderEX, LLC. The Power of Simulation". At the top right is "TRADING AREA Lobby | Log out". Below this is a navigation bar with links: HOME, OUR PRODUCT, OUR TEAM, SUPPORT/FAQ, NEWS, CONTACT, and the date Wednesday, March 19, 2008. A "SELECT LOBBY:" dropdown menu is set to "---- Select ----". Below this is a table titled "Select A Network | Network Simulation Data".

Network Name	Features	Join As
OrderBookToCall	Order Book Call Auction	Prop Trader <input type="radio"/> Equity Trader <input checked="" type="radio"/> <input type="button" value="JOIN"/>
DealerPipeline	Block Trading Dealer	Dealer <input type="radio"/> Prop Trader <input type="radio"/> <input type="button" value="JOIN"/> Equity Trader <input checked="" type="radio"/>

The initial screen may look like this. Click on okay to allow the program to run in your PC's browser.



## 1) ORDER BOOK MARKET

The TraderEx order book system maintains a limit order book and enforces price and time priority among orders. With the order book, you can do the following:

- Buy shares immediately with a market order. You will buy from the sell limit orders (OFFER) that others have entered into the book. The lowest priced offer will trade first.
- Attempt to buy shares by placing your own limit buy orders (BID) and hoping they execute against incoming sell orders
- Sell shares immediately with a market order. You will sell to the buy limit orders (BID) that others have entered into the book. The highest priced bid will trade first.
- Attempt to sell shares by placing your own limit buy orders (OFFER) and hoping they execute against incoming buy orders

Below is a representative screen in the order book market.

Price	32.80	33.00	33.00	33.00
Volume	50	17	24	47
Time	9:49:32	9:46:38	9:46:36	9:46:36
<b>ORDER DRIVEN</b>				
Standard View		Compressed View		
<b>Bid/TA</b>	32.80		<b>Offer/TA</b>	
	151		13	
	SELL	BID \$	OFFER	BUY
		34.00	131	<input type="text"/>
		33.90	160	<input type="text"/>
		33.80	127	<input type="text"/>
		33.70	236	<input type="text"/>
		33.60	152	<input type="text"/>
		33.50	96	<input type="text"/>
		33.40	128	<input type="text"/>
		33.30	375	<input type="text"/>
		33.20	232	<input type="text"/>
		33.10	142	<input type="text"/>
		33.00	13	<input type="text"/>
		32.90		<input type="text"/>
		151	32.80	<input type="text"/>
		187	32.70	<input type="text"/>

Enter the sell market order size (1-99) and click SELL  
You will sell and the highest bid quote in the market

Enter the buy market order size (1-99) and click BUY

If you do nothing, as time progresses the computer along with the other live participants will generate both limit and market buy and sell orders, and market quotes, trades, and transaction prices will evolve accordingly. The machine-generated orders are statistically generated to reflect three motives for trading:

- **Information motives** – informed buyers purchase below true value, or informed seller sell at prices above true value
- **Liquidity motives** – buyers and sellers without information buy to put cash to work, or sell to raise cash for other purposes
- **Technical motive** (momentum trading) – momentum, trend-following buyers will buy stock that has recently risen in price, and technical sellers will sell stock that is trending downward

Each of these motives for trading will react to market conditions and to you as a trader. Remember, TraderEx prices do not evolve purely randomly. Trends and reversals will occur during a trading day.

### The TraderEx Screen

The top row of the screen provides the name of the network you are in along with status and the time of day in the simulation. Below that is the ticker of recent trades.

<b>NETWORK NAME:</b> UserGuideOB		<b>STATUS:</b> <span style="color:red">●</span> <span style="color:yellow">●</span> <span style="color:green">●</span> Running		<b>DAY:</b> 1 of 0		<b>TIME:</b> 10:08:44 AM			
<b>Price</b>	33.10	32.90	33.10	33.00	32.80	33.00	33.00	32.80	
<b>Volume</b>	8	57	16	13	50	17	24	47	560
<b>Time</b>	10:06:10	10:06:10	10:00:26	10:00:26	9:49:32	9:46:38	9:46:36	9:46:36	9:42:32

The top lines on the screen are straightforward:

Network Name	“UserGuideOB” is the name of this simulation network that was selected in the lobby
Status	Whether the simulation is initializing, waiting, or running
Day and time	Where we are in the simulated trading day
Price	Price of the most recent trade is 33.10
Volume	Size of the most recent trade is 8
Time	Time of the most recent trade is 10:06:10

**Comment [R1]:** What is OB? I not see it on my screen. If it should be here, it should be identified.

Bid/TA		Offer/TA	
32.80		33.00	
178		40	
SELL	BID	OFFER	BUY
	34.00	131	<input type="text"/>
	33.90	160	<input type="text"/>
	33.80	127	<input type="text"/>
	33.70	236	<input type="text"/>
	33.60	152	<input type="text"/>
	33.50	96	<input type="text"/>
	33.40	128	<input type="text"/>
	33.30	375	<input type="text"/>
	33.20	299	<input type="text"/>
	33.10	142	<input type="text"/>
	33.00	40	<input type="text"/>
<input type="text"/>	32.90		<input type="text"/>
<input type="text"/>	178	32.80	
<input type="text"/>	187	32.70	
<input type="text"/>	238	32.60	
<input type="text"/>	342	32.50	
<input type="text"/>	343	32.40	
<input type="text"/>	187	32.30	
<input type="text"/>	75	32.20	
<input type="text"/>	239	32.10	

On the left is the central limit order book (CLOB). It operates as a standard price-time priority market.

The quotes are \$32.80 bid and \$33.00 offer. The book shows that 178 units are at the \$32.80 bid, and that 40 units are at the \$33 offer.

Other limit buy orders are shown below the best bid, and other limit sell orders are shown above the best offer. The total number of units posted at each price level is show next to each limit price. Focus on the middle of the order book; this is where you will find the best bid/offer.

To submit a market order, enter the quantity you wish to buy or to sell in the boxes at the top. Quantity is measured in units, where a unit is 100 shares. Let us enter a 22 unit order (2200 shares) to sell at market. We do this by entering 22 in the white box to the left of the label SELL (just above the limit order book). This will result in your selling 22 units at the highest posted bid on the book. Or, you can enter 22 in the white box to the right of the table Take (also just above the limit order book); this will result in your buying 22 units “at market” (i.e., at the lowest posted offer on the book).

If your market order is for a number of units equal to or less than the posted quote that it will execute at, your order will execute completely at that quote. If your order

**Comment [R2]:** I believe we have replaced hit and take with buy and sell.

is for a larger number of units, it will “walk the book” (that is, execute at successively inferior prices until it is completely filled). All orders are displayed, and order larger than the quantity at the best bid and ask quotes “walk the book” to the next price level. For instance, a market order to buy 80 will buy 40 at 33.00 and the next 40 at 33.10 for an average purchase price of 33.05.

	33.30	235		X
	33.20	20		X
X		33.10		X
X		33.00		X
X		32.90		X
X	35 (32)	124	32.80	X
X		109	32.70	
X		238	32.60	
X		350	32.50	
X		293	32.40	
X		109	32.30	
X		42	32.20	
X		165	32.10	

You can enter a limit order into the order book by clicking on the box next to the price limit that you want your order placed at.

Once you enter an order, it will be visible in the book. In the screens at left, you have placed a buy limit order in the book at \$32.80. The quantity of your order is 35. As indicated in parentheses, 32 units to buy from other traders have time priority over you and will trade before your order begins to execute. Your order added to all the other orders gives a total bid quantity of 124.

Limit orders can be made larger by clicking on the existing order and adding a new amount to it.

To cancel a limit order that you have previously placed, click on the red X next to it.

All transactions (both computer generated, your orders, and the orders of other live participants) are time stamped and logged in the middle third of the screen. The list is scrollable, and columns can be rearranged by dragging and dropping. The data can also be highlighted and copy-pasted into a spreadsheet for analysis. Click on the All Trades button and every trade is shown. Alternatively, click on the My Trades button and your trades only are shown.

HISTORY					
All Trades					
TIME	PRICE	VOL	BID	OFFER	SYMBOL
12:29:36	37.10	6	35.80	36.50	Stock1
12:29:36	37.10	13	35.80	36.50	Stock1
12:29:36	36.60	13	35.80	36.50	Stock1
12:29:36	36.50	30	35.80	36.50	Stock1
12:25:22	36.50	14	34.80	35.40	Stock1
12:25:22	36.10	30	34.80	35.40	Stock1
12:25:22	35.40	46	34.80	35.40	Stock1
12:20:52	36.50	17	34.80	36.10	Stock1
12:20:52	36.20	57	34.80	36.10	Stock1
12:20:52	36.10	10	34.80	36.10	Stock1
12:17:46	36.10	20	34.80	35.90	Stock1
12:17:46	35.90	21	34.80	35.90	Stock1
12:17:06	35.90	5	34.80	35.60	Stock1
12:17:06	35.80	14	34.80	35.60	Stock1

The prices in the center of the order book in red and green are the low and high prices of trades so far in the day. At the bottom right of the screen is the total number of shares in your position and your average price.

STOCK 1 STATS	
Net Position	-113
Avg. Price	37.1543
Cash	4133.50
P & L	-307.40
Total Volume	237

Here, the user is short 113 units of the stock. To make a profit, they must buy the stock back at a price that is less than their average selling price for the current short position, which is 37.1543.

If you are playing as a day trader, you want your position to be flat by the end of the day, which means you have no position at the close of trading.

There are two chart graphs available by clicking on the tabs. By watching the bid and the ask quotes you could gauge market demand. By watching the difference between the quotes (the spread) you can gauge the liquidity of the market. The second chart includes market VWAP (Volume Weighted Average Price), and the last sale price. You can toggle between the two charts as you see fit.

### Saving simulation results

At the end of the simulation, the final trading blotter can be captured to document your performance. Before exiting out of TraderEx, copy and paste from the HISTORY area for All Trades and My Trades into a spreadsheet.

## 2) DEALER MARKET

The dealer market display is below. The screen shows three dealers, each of whom are posting bid and offer quotes that are good for 99 units. The dealer(s) with the highest bid is outlined in green, and the dealer(s) with the lowest offer is outlined in red. The simulation does not allow for “preferencing;” only the dealer(s) with the highest bid is eligible to receive incoming sell orders, and only the dealer(s) with the lowest offer will receive incoming buy orders.

NETWORK NAME: Dealer\_4\_4    STATUS: ●●● Running    DAY: 1 of 0    TIME: 3:59:58 PM

Price	20.80	20.80	20.80	21.00	21.00	20.80	21.00	20.70	21.00	21.00	20.70	21.00	21.00	20.70	21.00		
Volume	24	30	46	20	55	41	35	41	23	24	51	21	51	29	44	52	99
Time	3:58:00	3:55:28	3:52:36	3:50:02	3:47:30	3:44:38	3:42:04	3:39:16	3:36:24	3:33:32	3:30:58	3:28:46	3:25:54	3:23:22	3:20:30	3:17:44	3:14:52

**DEALER**

LOW: 19.10    HIGH: 21.00  
VOLUME: 6029    VWAP: 20.5600

SELL BUY

QUOTE

BID: 19.90    OFFER: 21.50

Submit

0	bob	20.80	21.00	greg	0
0	greg	20.40	21.50	bob	0
0	bruce	19.90	21.50	bruce	0

**HISTORY**

SYMBOL	VOL	PRICE	TIME	SIDE	BID	OFFER
Stock1	99	21.00	3:16:26	Buy	20.70	21.00
Stock1	99	21.00	3:14:32	Buy	20.70	21.00
Stock1	99	21.00	3:12:20	Buy	20.70	21.00
Stock1	99	21.00	3:11:42	Buy	20.70	21.00
Stock1	35	20.90	3:06:38	Sell	20.50	20.90
Stock1	49	20.90	3:03:46	Sell	20.50	20.90
Stock1	33	20.90	3:03:46	Sell	20.50	20.90
Stock1	28	20.90	3:00:54	Sell	20.50	20.90
Stock1	20	20.40	2:57:04	Buy	20.40	20.70
Stock1	30	20.70	2:52:22	Sell	20.40	20.70
Stock1	55	20.80	2:51:44	Buy	20.40	20.80
Stock1	37	20.70	2:49:28	Sell	20.40	20.70
Stock1	36	20.70	2:46:38	Sell	20.40	20.70
Stock1	26	20.40	2:17:20	Buy	20.40	20.50
Stock1	45	20.40	1:30:40	Buy	20.40	20.50
Stock1	56	20.40	1:28:06	Buy	20.40	20.50

You change your quotes by clicking the up and down buttons, and clicking submit. Quote moved both bid and offer in the same direction.

The dealers, upon receiving incoming orders, buy at their bid quotes and sell at their offers. While trading to “make a market,” the dealers must manage their positions so as to avoid becoming excessively long or short.

Comment [R3]: The box was hiding text here. I moved the box.

### 3) CALL AUCTION

The call auction is mechanism for batching buy and sell orders at one point in time for a single batched execution at a single price and is viewed as a trade. The call auction will occur at the market open, midday, and at the market close.

MARKET CALL				
Indicative		Imbalance		
19.90		192		
BIDS		OFFERS		
0	0	21.40	961	0
0	0	21.30	961	0
0	0	21.20	961	0
0	0	21.10	961	0
0	0	21.00	961	0
0	0	20.90	961	0
0	0	20.80	961	0
0	0	20.70	961	0
0	0	20.60	961	0
0	0	20.50	961	0
0	0	20.40	933	0
0	0	20.30	895	0
0	0	20.20	723	0
0	36	20.10	382	0
0	118	20.00	283	0
0	332	19.90	148	0
0	491	19.80	98	0
0	659	19.70	78	0
0	770	19.60	0	0
0	770	19.50	0	0

When the auction executes, the system identifies the price that maximizes the total number of shares that will execute. In the example, the the price of 19.90 enables 148 units to be matched. The earliest of the 332 units to buy at that price will execute, and the remaining 184 units to buy remain unexecuted.

Only limit orders can be submitted to the call auction. They are entered by clicking on the box next to the price level you select and the side of the market (buy or sell) that you want to be on.

#### 4) BLOCK TRADING FACILITY/DARK POOL

Dark liquidity pools are revolutionizing trading by allowing large block traders to meet without disclosing their interests to buy and to sell large market-moving quantities of stock.

In the example, the order book shows that there is a 20.80 bid for 187, and 44 offered at 20.90. A buyer interested in buying 250 units would drive the price up in the order book. Using the Block Board, the trader can click on the Market/Limit toggle button and the Buy/Sell toggle button to place an order in the “dark pool.” A block board buy market order is available to any counterparty that will sell 250 or more at the midpoint of the bid-ask spread, which is 20.85 in this illustration.

	21.20	175		X
	21.10	38		X
	21.00			X
	20.90	44		X
X		187	20.80	
X		66	20.70	
X		238	20.60	

**BLOCK BOARD**

Midpoint of Bid/Ask Spread: 20.85

STK1	AAPL	ISE	GOOG
------	------	-----	------

TIME	\$	#	B/S	STATUS
9:30:14	Mkt	250	Buy	Active

Market

Buy

Price:

Volume:

The block board is only for “institutional orders” with a minimum size of 250. Block board orders are separate from the displayed order book (they are not included in the order book display and they do not execute against limit orders on the displayed order book). The prices of block board trades are generally determined from the order book midspread price. It is possible to trade anywhere at any price from the ask price down to the bid price.

Limit orders can be placed in the block board in an attempt to achieve a better price than the midspread. A limit order with a limit price is that is less aggressive or “worse” than midspread is considered a “Passive Order.” A market order or a limit order with a price at or “better” than the midspread is an “Active Order.”

The display for stock 1 (STK1) can show the following colors:

- Orange: There is a block board order for that stock
- Orange with Red: You have placed a sell order
- Orange with Green: You have placed a buy order
- Yellow with Green: You have placed an active buy order and there is a passive sell order
- Yellow with Red: You have placed an active sell order and there is a passive buy order

## PERFORMANCE MEASURES

TraderEx gives you a number of ways to assess your trading.

- Average Buy vs. VWAP
- Average Sell vs. VWAP
- Average Absolute Position (RISK)
- Realized P&L
- Unrealized P&L