

Case #1: The Order Book Market



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B. Weber, September 2012

Who moved my Alpha? – Assessing execution quality in order book systems:

How should you handle instructions to buy or sell large quantities of shares in a market? There is no simple answer. Trading decisions should reflect the fund manager’s style – momentum, value, etc. – and the liquidity sources available – e.g., order book, capital commitment, and auction.

In this case study, you will trade a large order in a single stock. You will be able to assess measures of the quality of the outcome resulting from your trading decisions. At the end, your execution prices will be compared to a few simple benchmarks, and to the other participants. – Impediments to more effective trading will become evident, and you will also identify the factors that can lead to good trading outcomes.

For a fund manager, trading costs matter. And the more you trade, the more transactions costs can eat into your investment returns. Consider these comments:

- *“We turn over often, so the transaction costs are much more meaningful to me – a penny to me can translate to as much as one and a half per cent per year in return, so we’re very careful about that stuff, and trying to get those costs lower.”*

Head trader of a Chicago-based fund explaining that his firm’s high portfolio turnover rate makes lower transaction costs crucial¹

¹ *“Thinking outside the black box”*, Hedge Fund & Investment Technology, December 2004.

Traditionally, money managers told their brokers what buy and sell instructions they wanted to execute for the portfolio(s) they were managing. The broker then made the “micro-level” trading decisions on behalf of the client. After the trading activities were completed, the broker would report back on the average trade price achieved. Few alternative trading systems (ATSS) and multilateral trading facility (MTFs) were available. Greater IT capability and “direct market access” (DMA) has changed this:

“It used to be impossible to not need a broker to do this kind of stuff – we’d give them our orders and they’d work them. Now we have all this capability in-house, because the price of computer connectivity has come down so much ...” Head trader²

With DMA alternatives today, investors can handle their own orders, entering, updating, and canceling buy and sell orders. In an order-driven market, the basic order types are market and limit orders, and a DMA participant sees the full “depth of book.” The basic choices a trader has to make are timing, size of order, and type of order.

The Big Order

In TraderEx, the networked Order Driven mode will have a market display as shown below. The fund manager indicated the previous day that they planned to add to the stock’s weighting in the fund. Before the open, you are given an instruction to buy a large quantity (you will be told the amount or it will display on your screen), to which the fund manager added *“I don’t want to overpay, and I may have more to buy in the afternoon after I speak to an analyst.”*

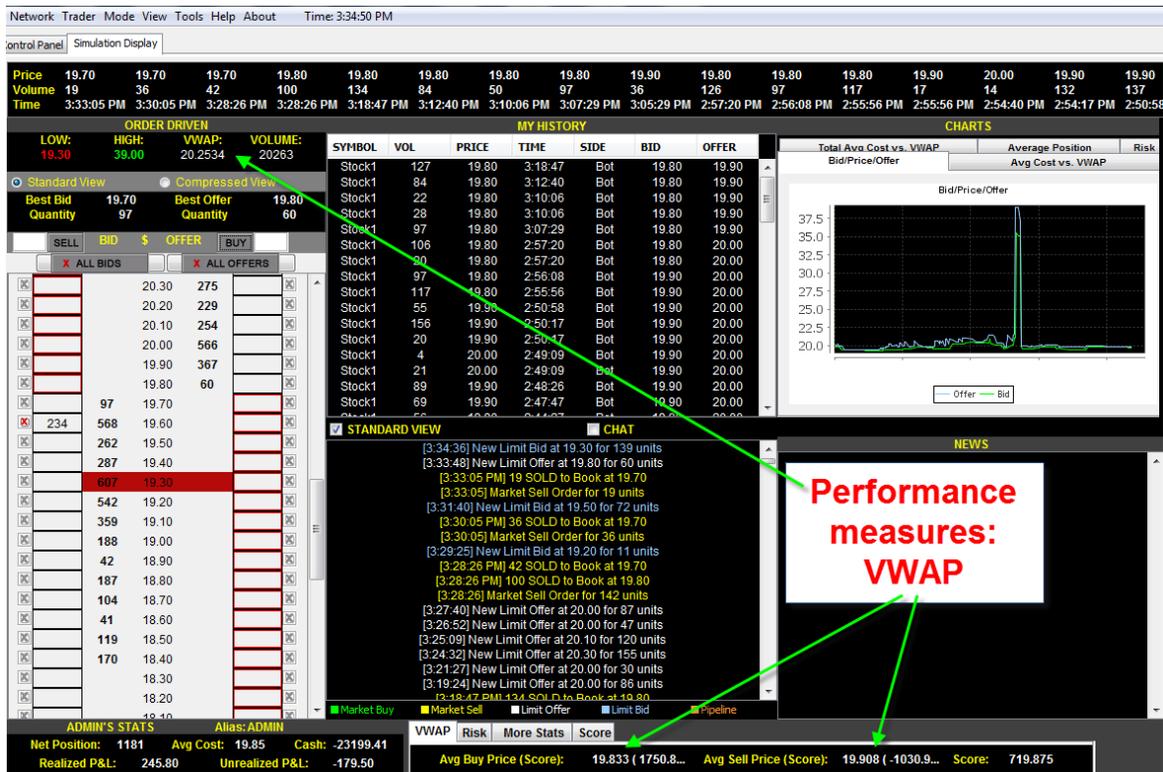
Performance

Once the full trade is completed, how have you done as a buy side trader? Volume-weighted average price (VWAP) is a common benchmark, and is computed as the ratio of the dollar transaction volume to share volume over the trading horizon. To illustrate, if three trades occur, 1,000 shares at 20.00, 5,000 shares at 20.50, and 10,000 shares at 21.00:

$$\text{VWAP} = \frac{20.00 \times 1,000 + 20.50 \times 5,000 + 21.00 \times 10,000}{1,000 + 5,000 + 10,000} = 20.78125$$

² Ibid, Hedge Fund & Investment Technology, December 2004.

VWAP is regarded as a good benchmark approximation of the price a patient trader can achieve. Often, intraday or multiday VWAP measures are computed. When you trade and when you reach the close, compare your average cost to VWAP. Did you complete the full instruction? Is the day's close above or below your average price? Did your trading add value to the fund's performance? Can you attribute the P&L at the close to the trading desk and to the fund manager's stock selection? We will return to these questions in the post-trade assessment.



In this illustration, the trader, Admin, has a target position of 1,500 shares long. He has bought 1181 already (Net Position on lower left), and therefore has 419 more to buy. As the TraderExercise tutorial demonstrated, market and limit orders can be entered, and in this case the trader has placed a limit orders at \$19.60 for 234. The red-X buttons to the left are for cancelling the orders.

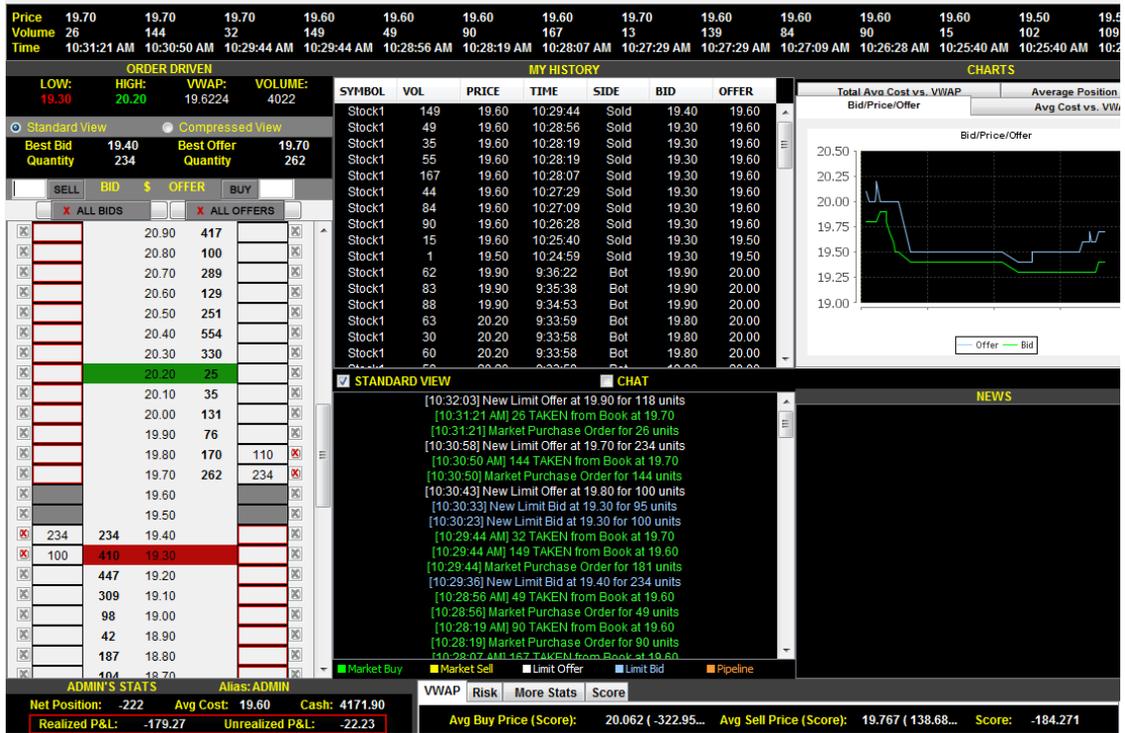
The user's trades are shown in the MY HISTORY table in the center, and below all order activity in the market is shown. Using market orders (enter a quantity and click on "BUY") and buy limit orders on the bid side of the book (click on the rectangle at the price level you choose), Admin should accumulate the remaining 319 over the remaining 25 minutes of the simulation.

Notice Admin has both bought and sold. The average buy price is 19.833, which is below the VWAP of 20.25. However, Admin still has a significant quantity to buy. The offer quote in the book is 19.80, and our limit order to buy 234 at 19.60 is not at the “top of the book.” Buying the remain quantity could raise the average buy price.

How does the trader know if he is trading effectively? Admin wants to complete the instruction but keep his average purchase at or below VWAP. In addition, at the end of the simulation, Admin’s completed order and his average purchase price will be compared to the results achieved by the other traders in the market.

Proprietary and Speculative Traders

In TraderEx’s networked Order Driven mode, some trading teams may be instructed to play the role of proprietary traders, or speculative traders. Prop traders will buy and sell to profit from short-term price swings and opportunities. One approach, as shown in the market display below, is to place limit orders to buy and to sell. The prop trader is seeking to buy low and sell high. Good luck. But at the end he must return to a flat (zero) position in the shares. At present, ADMIN is short 222 and will generate a realized profit only if he can buy back for less than his average purchase price of \$19.60.



Post-Trade Assessment

The software will produce a LeaderBoard at the end that details the trading results achieved. In the Leader Board below, 14 teams finished with a short position. Many of these traders were instructed to sell 1,200. Of the teams that sold the full order, Jothmani performed the best and sold at the highest price (\$20.226 vs. \$20.03 VWAP). In effect, Jothmani has contributed about \$0.20 to the Alpha of the fund manager she was selling for.

		HIGH: 20.40	LOW: 18.70	LAST: 20.40	VWAP: 20.03	VOLUME: 38336	TRADES: 692										
Net Pos - Hide Details		VWAP - Hide Details			PNL - Hide Details		RISK - Hide Details			Hide ALL Details							
RANK	TRADER	TOTAL SCORE	NET. POS	NET. POS :am / :pm	AVG. BUYING PRICE (SCORE)	AVG. SELLING PRICE (SCORE)	VWAP SCORE	REALIZED / UNREALIZED P&L	P&L SCORE	RISK SCORE	AVG. POS.	TARGET	% MKT SHARE	TOTAL VOL	MKT ORDER VOL	TRADES	
Simulation #1 – Sell 1,200																	
SELLERS:																	
1	CATHERINE	1118.0	-1200	-1096/ -630	20.207 (-817.961)	19.978 (-299.572)	1117.5	-1055.63 / -506.97	1562.59	0.00	817.91	0	27.17	10414	8896	138	
2	LUCA	-297.0	-1200	-675/ -925	19.915 (45.546)	19.815 (-342.886)	-297.3	-40.18 / -702.22	-742.40	0.00	694.05	0	5.22	2000	1940	39	
3	BOB	-130.0	-1200	0/ 0	0.000 (0.000)	19.921 (-130.140)	-130.1	0.00 / -575.20	-575.20	0.00	118.80	0	3.13	1200	702	20	
4	TEMP1	-127.0	-1060	-383/ -760	0.000 (0.000)	19.909 (-127.162)	-127.2	0.00 / -520.30	-520.30	0.00	507.55	0	2.77	1060	809	25	
5	SUJATA	39.0	-901	-100/ -300	0.000 (0.000)	20.072 (38.567)	38.6	0.00 / -295.60	-295.60	0.00	246.00	0	2.35	901	501	15	
6	PER	86.0	-1200	0/ 0	0.000 (0.000)	20.100 (85.581)	85.6	0.00 / -359.50	-359.50	0.00	115.56	0	3.13	1200	700	17	
7	MONTHER	104.0	-2335	0/ 0	0.000 (0.000)	20.074 (104.015)	104.0	0.00 / -762.00	-762.00	0.00	195.97	0	6.09	2335	200	32	
8	ADAM	104.0	-1205	-320/ -570	0.000 (0.000)	20.116 (104.417)	104.4	0.00 / -342.50	-342.50	0.00	483.20	0	3.14	1205	320	29	
9	CAROLINE	155.0	-1200	-600/ -900	0.000 (0.000)	20.158 (155.061)	155.1	0.00 / -290.00	-290.00	0.00	371.97	0	3.13	1200	600	13	
10	NIALL	185.0	-1200	-600/ -1000	0.000 (0.000)	20.183 (185.060)	185.1	0.00 / -260.00	-260.00	0.00	376.49	0	3.13	1200	500	18	
11	STEVE	206.0	-1200	-1186/ -1186	19.700 (32.582)	20.163 (173.279)	205.9	45.79 / -284.99	-239.20	0.00	898.27	0	3.65	1398	14	29	
12	RIIKKA	208.0	-1200	-1075/ -1126	20.100 (-4.891)	20.197 (213.053)	208.2	6.69 / -243.59	-236.90	0.00	593.43	0	3.49	1338	269	26	
13	JOTHIMANI	259.0	-1200	-1200/ 0	20.188 (-90.333)	20.226 (349.196)	258.9	21.99 / -208.18	-186.20	0.00	434.06	0	6.10	2338	0	35	
14	JOHANN	290.0	-1250	-1050/ -1250	19.836 (106.014)	20.131 (183.891)	289.9	162.20 / -335.90	-173.70	0.00	1043.43	0	6.13	2350	500	36	

Among the Prop Traders, the assessment criteria are to return to a position within +/- 100, and to obtain a positive realized profit. Stefan in the Leader Board below earned a closing mark-to-market profit of 341.6.

HIGH: 20.90		LOW: 19.00		LAST: 20.10		VWAP: 20.06		VOLUME: 115852		TRADES: 652						
Net Pos - Hide Details			VWAP - Hide Details			PNL - Hide Details			RISK - Hide Details			Hide ALL Details				
RANK	TRADER	TOTAL SCORE	NET. POS	NET. POS :am / :pm	AVG. BUYING PRICE (SCORE)	AVG. SELLING PRICE (SCORE)	VWAP SCORE	REALIZED / UNREALIZED P&L	P&L SCORE	RISK SCORE	AVG. POS.	TARGET	% MKT SHARE	TOTAL VOL	MKT ORDER VOL	TRADES
SELLERS:																
1	SUJATA	-1973.0	-53	2786/47	20.142 (-1120.620)	20.007 (-852.199)	-1972.8	-1969.73 / -52.66	-2022.38	0.00	352.57	0	25.19	29181	16403	127
2	CATHERINE	-178.0	-9	-503/313	20.061 (31.239)	20.041 (-209.130)	-177.9	-177.68 / -8.63	-186.31	0.00	654.25	0	15.33	17763	7250	85
3	JAN	-51.0	-73	1616/1275	20.044 (82.437)	20.032 (-133.062)	-50.6	-48.22 / -70.68	-118.90	0.00	975.97	0	6.91	8007	2808	47
4	STEFAN	351.0	-10	46/0	20.090 (-87.204)	20.192 (438.157)	351.0	349.68 / -8.08	341.60	0.00	34.97	0	5.92	6862	3860	41

Reflections on VWAP

Not everyone in the markets believes VWAP to be a good benchmark. How can it be misused? What would you do as a trader if your bonus were a function of the amount by which you beat a daily VWAP measure?

To be more concrete, what if you have 200,000 more to buy at 3:45 pm. The market closes in 15 minutes, and the price in the market is \$0.50 over VWAP. Do you buy the last 200,000? How will the fund manager react if you only buy 700,000? Can the last 200,000 wait for the next day?

Consider the following comments from senior traders:

- *“The biggest firms ... think their trading operations are their competitive advantage, that their traders can beat VWAP. Those firms are less inclined to use algorithms.”*
- *“Though we always compare the VWAP of the market to the executing price, that’s not what’s most important. For us, we look at pure market impact – the price we manage to reach on the execution compared to the price at the beginning of the execution”*

Questions - Take notes during the simulation so you can answer these questions.

1. Record your closing position. Did you complete your order? If not, explain why.
2. What was your trading strategy? At any point did you change your trading strategy? When and why?

3. Write down your closing P&L, your average transaction price, and the VWAP for the day. Explain why you did or did not beat VWAP.
4. What positive or negative effects did price changes have on you?
5. The “My Trades” and “All Trades” data in the blotter at the center of the screen can be highlighted with the cursor, and copy-pasted into Excel. Do this, and graph the prices, and your trades or your accumulating position over the day. What would you do differently if you played again?
6. Using Get Data, download the three spreadsheets containing the orders submitted to the market, the trades that occurred and the P* changes. Do this, and graph the prices, and your trades or your accumulating position over the day. What would you do differently if you played again?