

# TraderExercise #1



Version: July 13, 2008

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

**How should a trader 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, dealers’ capital commitment, and auctions.**

**In this case study, you will trade a large order in a single stock and measure 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. – We will then discuss the impediments to more effective trading and identify the factors that 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 crucial<sup>1</sup>

Traditionally, money managers told their brokers what buys and sells they wanted to execute for the portfolio(s) they were managing. The broker then made the “micro-level”

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

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 (ATs) and multilateral trading facility (MTFs) were available. Greater IT capability and “direct market access” (DMA) has changed this:

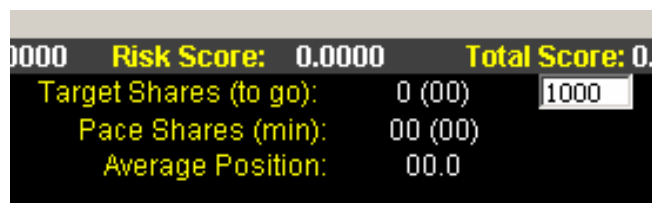
- *“It used to be impossible to not need a broker to do this kind of stuff – we’d give them our orders and they’d work them. Now we have all this capability in-house, because the price of computer connectivity has come down so much ...”* Head trader<sup>2</sup>

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**

The fund manager indicated the previous day that they planned to make a large change in the stock’s weighting in the fund. In TraderEx, the lower right of the market display shows “**Target Shares (to go)**”, which is the number of shares you have been instructed to trade. Click on the Target Shares to open the white data entry box, and enter the order given to you. A sell instruction will be a negative number. In the example, the instruction is to Buy 1,000. After hitting the Enter/Return key, the quantity will appear as Target Shares and in parentheses, the remained unexecuted quantity. After buying 300, for instance, the display will show “ **Target Shares (to go): 1,000 (700)** ”

When you were given the instruction to buy or to sell, the fund manager added “*I want good prices, and I may have more to trade in the afternoon after I speak with an analyst.*”



0000	<b>Risk Score:</b>	0.0000	<b>Total Score:</b>	0.0000
	<b>Target Shares (to go):</b>	0 (00)	<input type="text" value="1000"/>	
	<b>Pace Shares (min):</b>	00 (00)		
	<b>Average Position:</b>	00.0		

<sup>2</sup> Ibid, Hedge Fund & Investment Technology, December 2004.



At the open, you could buy up to 44,000 at 19.90 with a market order. The most willing buyers visible on the left or bid-side of the order book are willing to pay 19.80. Our market order to Buy 10 is visible at the top of the offer side of the book, and first trade will be 10,000 shares done at 19.90.

After buying 10 with a market order, the order to sell 44 will decrease to 34, and the book will look like this:

		20.20	175		X
		20.10	38		X
		20.00			X
		19.90	34		X
X	70	257	19.80		
X		87	19.70		
X					

Entering a buy limit orders on the bid side of the book is done by clicking on the rectangle at the price level you choose. In the example above, you are entering a limit order to buy 70 at 19.80.

Later in the simulation the order book will show with green and red, the high and low prices of the day. The user now has two limit orders to buy in the book. TraderEx uses price-time priority in executing orders on the book. The “**(87)**” indicates that the user’s order to buy 12 are behind the other 87 shares to buy at 19.70.

		20.40	83		
		20.30	235		X
		20.20	200		X
		20.10	38		X
		20.00	29		X
X	5 (0)	5	19.90		
X		187	19.80		
X	12 (87)	99	19.70		

As the user you have the task of continuing to accumulate the position of 1,000 over the course of the 6 ½ hour trading day (about 20-30 minutes in real time). As you trade, how are you assessing your results?

In the illustration below, the user has bought 340 (“**Net Position**”) at an average per share price of \$21.13, which is greater than the VWAP of 20.9080 at 12:49 pm. The user still has a substantial quantity, 660, to buy. The offer quote in the book is 21.80, and our limit order to buy 20 at 20.70 is “top of the book .”

NETWORK NAME: GEMS OB 1			
Price	21.80	21.90	21.90
Volume	55	20	3
Time	12:49:58	12:44:22	12:42:20
ORDER DRIVEN			
LOW:	19.90	HIGH:	21.90
VOLUME:	3077	VWAP:	20.9080
Standard View		Compressed View	
Best Bid	21.70	Best Offer	21.80
	20		3
<input type="button" value="SELL"/> <input type="button" value="BID"/> <input type="button" value="OFFER"/> <input type="button" value="BUY"/>			
Down	Center	Up	
	22.50		
	22.40		
	22.30		
	22.20		
	22.10	77	
	22.00	141	
	21.90		
	21.80	3	
X 20 (0)	20	21.70	
X		21.60	
X 60 (0)	104	21.50	

BRUCE'S STATS (EQUITY TRADER)				VWAP Score: -73.0215 P&L Score: 194.8003 Risk Score: 86281.9766 T			
Net Position:	340	My Volume(%Mkt Shr):	340 (4.19%)	Avg Selling Price (score):	0.000 (0.000)	Target Shares (to go):	1000 (660)
Cash:	(\$7,183.20)	Realized P&L:	\$0.00	Avg Buying Price (score):	21.127 (-73.021)	Pace Shares (min):	552.0 (428.3)
My Avg Cost:	\$21.13	Unrealized P&L:	\$194.80	Cost to Target:	\$14,388.00	Average Position:	95.2

## 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 10.00, 5,000 shares at 10.50, and 10,000 shares at 11.00:

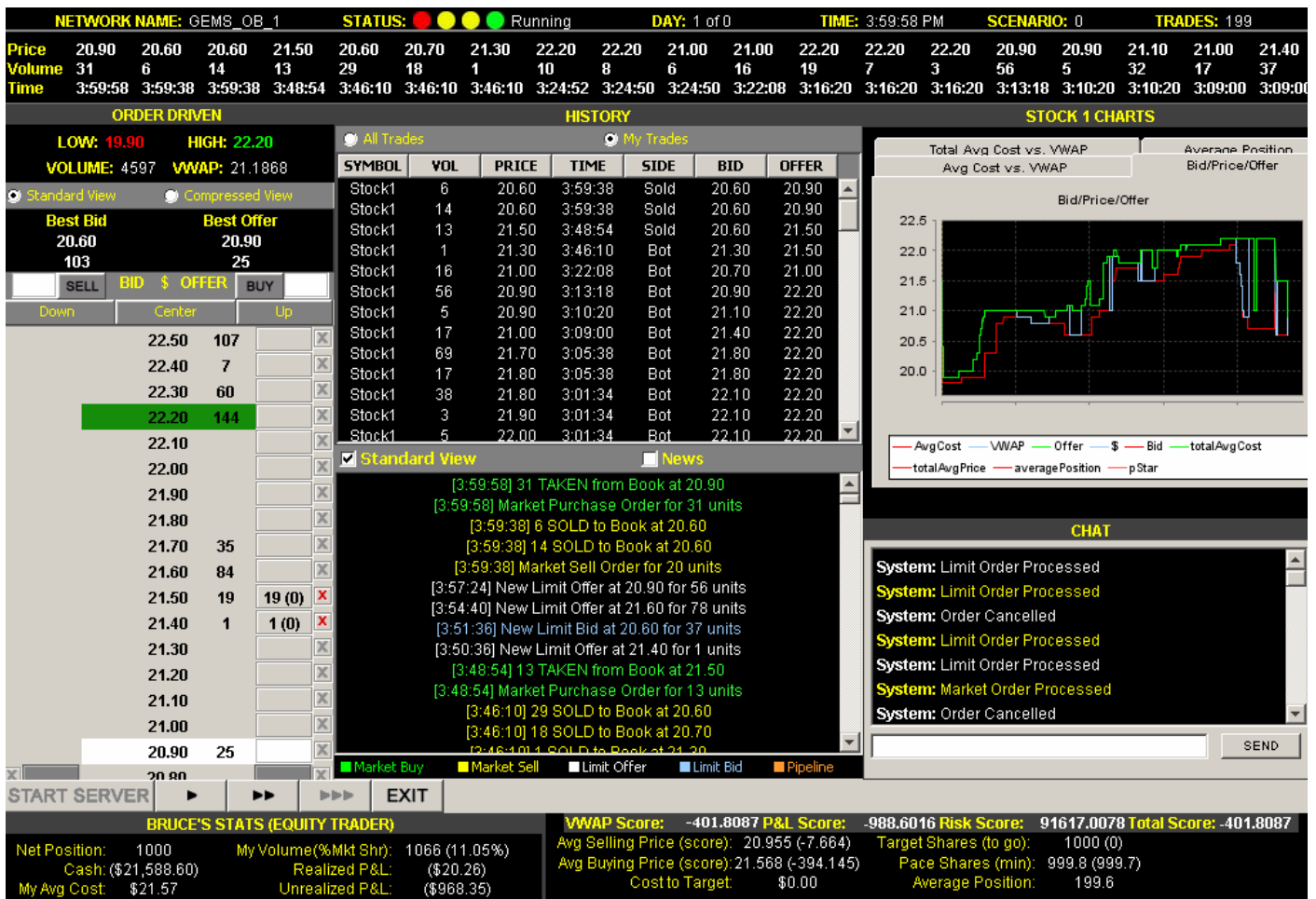
$$\text{VWAP} = \frac{10.00 \times 1,000 + 10.50 \times 5,000 + 11.00 \times 10,000}{1,000 + 5,000 + 10,000} = 10.78125$$

Often, intraday or multiday VWAP measures are computed. VWAP is regarded as a good approximation of the price for a “passive” trader. A passive trader is one that trades mostly with limit orders.

When you reach the close, compare your average cost to VWAP? Did you complete the full trade? 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 stock selection?

In the example below, the trader ended with a position of 1,000 acquired at an average price of \$21.57 compared to a VWAP of \$21.1868. The position shows a negative Unrealized P&L based on the closing bid price of \$20.60. The fund manager's stock pick was good, since the price rose from \$20.00 at the open, however the buying was done too close to the day's high of \$22.20.



## 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 more to buy at 3:45 pm. The market closes in 15 minutes, and the price in the market is 0.25 over VWAP. Do you buy the last 200? How will the fund manager react if you only buy 800 rather than the full 1,000? Can the last 200 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. What was your trading strategy when your order arrived? At any point that you change your trading strategy, note the change and the time.
2. When did prices change and what effect did that have on you?
3. Record your *closing position*. Did you get the job done and end with the desired trading position? If you did not complete your order, explain why.
4. Write down your closing P&L, your average transaction price, and the VWAP for the run. Explain why you did or did not beat VWAP.
5. What would you do differently if you played again?