

TraderEx Self-Paced Tutorial & Case:

Who moved my Alpha?

Understanding Trading Performance in an Order Book Market Structure



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How should you handle instructions to buy or sell large quantities of shares in a market? Patient use of limit orders, or aggressive market orders before the price moves away from you? Several small orders or one large one? There is no simple answer. Trading decisions should reflect the fund manager’s style – momentum, value, etc. – and the liquidity available in the order book.

In this case study, you will trade a large order in a single stock and measure the results of your trading decisions. Your execution prices will be compared to a few simple benchmarks. – Additional simulations will expose you to other roles such as proprietary trading and market making. You will identify the impediments to good results, and identify the factors that lead to attractive 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

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” 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

¹ *“Thinking outside the black box”*, Hedge Fund & Investment Technology, December 2009.

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 Buy Order

Go to www.etraderex.co.uk and log in to the TraderEx website from Member Log-In (see Figure 1). Use DB1, DB11, DB21, DB31, or DB41 as the User Name, and DB as the password. After logging in, the Stand Alone Solitaire version is at the bottom of the lobby screen (Figure 2).

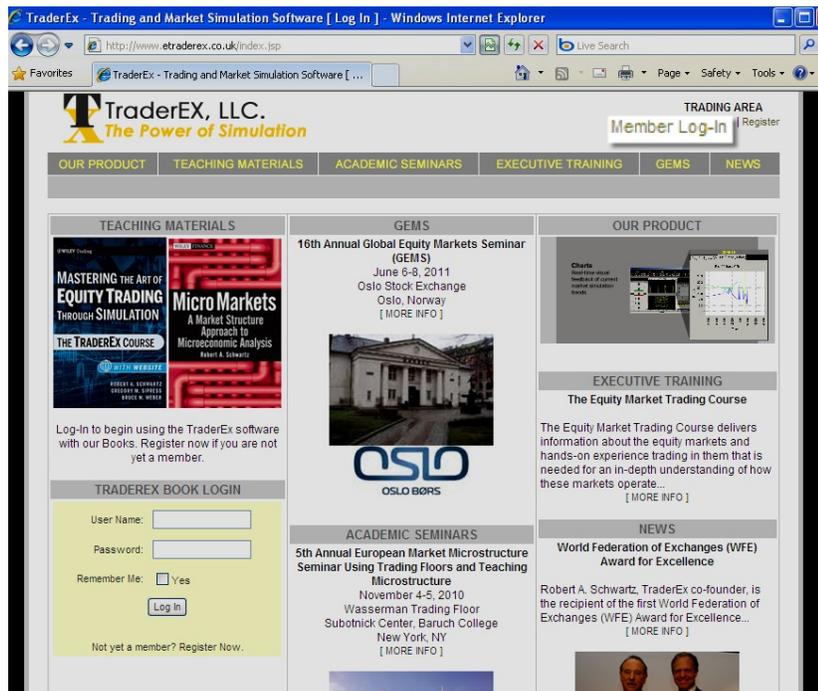


Figure 1: The Traderex website - www.etraderex.co.uk – and log-in link at upper-right

² Ibid, Hedge Fund & Investment Technology, December 2009.

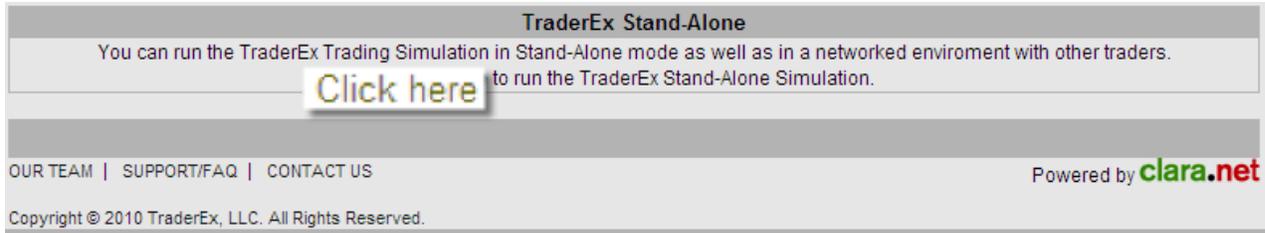


Figure 2: Launching the Stand-Alone Solitaire version of the software



Figure 3: Permitting the TraderEx java applet to load

Select Run to allow the Java applet to load, then choose the Order Driven mode with all default settings in the configuration window. The simulation will open, and after the GO button has been pressed twice, you will see the market display below. The buy-side 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 500**, a large quantity that is 20-30% of the average day's volume. After giving you the instruction, the fund manager adds *"I don't want to overpay, and I may have more to buy in the afternoon after I speak to the leading analyst in the sector."*



Figure 4: The Traderex order book market structure

After the first trade at 9:32, the book looks as above. At this point, you could buy up to 80 at 20.20 with a market order. The most willing buyer in the order book is willing to pay 19.90. The first trade is 25 shares done at 20.10.

Using market orders (enter a size in the white rectangle and click on “BUY”) and buy limit orders on the left (bid) side of the book (click on the rectangle at the price level you choose), accumulate a position of 500 over the course of the next 6 simulated hours until the 16:00 closing time (about 15-30 minutes in real time). The largest order size you can enter is 99. As you trade, how are you assessing your results?

In the illustration below, the user has bought with limit and market orders at 20.00 to 20.30, and placed a limit order for 30 that still sit in the book at 19.90. The position is now 80, which has been bought at an average per share price of 20.07, which is better than the VWAP of 20.1114 at 10:40 am. However, we still have a substantial quantity (420) to buy.

The offer quote in the book is 20.30, and our limit order to buy at 19.90 is not “top of the book.” In fact, 8 units at 20.00, and 20 units at 19.90 have a higher priority to execute than our

order. The figure in parentheses (20) indicates that 20 units are in front of our order for 30 at 19.90.



Figure 5: Traderex display with VWAP and day's high (green) and low (red) prices shown

Performance and Contribution to Alpha

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:

$$\text{VWAP} = \frac{10.00 \times 1,000 + 10.50 \times 5,000 + 11.00 \times 10,000}{1,000 + 5,000 + 10,000} = 10.781$$

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.

Run the simulation for a full day up to the close of trading at 16.00 (4 pm). 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?

Good trading desks like to boast that they contribute to the investment manager's Alpha. Alpha is a measure of an investor outperformance relative to a benchmark. If a fund manager has a risk level equivalent to the S&P500, and generates a 3 percent return in a period when the index is up 2 percent, the PM's Alpha is 1%. If a trading desk is able to trade 0.2% better than VWAP, it can claim to have generated some of the investor's alpha. Can you attribute the P&L at the close to your trading desk on one hand, and to the investor's order (stock selection)?

Reflections on VWAP

Few in the markets believe VWAP to be an ideal benchmark. 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”*

How can VWAP 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 had 150 more to buy at 3:45 pm? For the +350 position, your average purchase price is below VWAP. The market closes in 15 minutes, and the price in the market is now \$0.50 over VWAP! Do you buy the last 150? How will the fund manager react if you only buy 350? Can the last 150 wait for the next day?

It is possible that the trader who waits for the next day will outperform VWAP both days, but will have raised the average purchase price overall for the fund manager. In real markets, VWAP is useful, but it can be gamed!

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

1. Record your closing position. Did you complete your 500 unit buy order? If not, explain what prevented you from completing the order?
2. Write down the closing P&L, your average buying price, and the VWAP for the day. Click on More Stats, and explain why you did or did not beat VWAP.
3. How well did you time your orders? What positive or negative effects did price changes over the day have on you?
4. What would you do differently if you played again?

Optional: Press the RESET button, and rerun the simulation. The parameter settings will be the same, so this is cheating. Nonetheless, see how much better you can do.

Exercises – Run the simulations described below.

- 1) The fund manager now wants you to sell the position, which is now **1,000 units**. Rerun the simulation with the Initial Price set to **22** (the stock rose 10%), and the Scenario Number set to **5**. At the end your position should be **-1,000**
 - a) Write down the closing P&L, your average selling price, and the VWAP for the day. Explain why you did or did not beat VWAP.
 - b) Click on  at the bottom of the TraderEx screen and open the trade data file in Excel. Graph the market prices and your trades as you accumulated your position over the day. Which trades had the largest impact on your results?
- 2) You are now trading for a hedge fund. The strategy you follow requires you to make an assessment at the opening and either go long, or go short **1,000 units**, then reverse the position to close flat (a zero position). The midpoint of the trading day is 12:45, at which point your position should be about 1,000. Rerun the simulation and set “Orders arrive every **2.5 minutes**”, with the Scenario Number set to **97**. At the end, your position should be 0.
 - a) Write down your closing P&L, your average selling price, and your average buying price. Explain the reasons you made or lost money in the simulation.
 - b) Click on  at the bottom of the TraderEx screen and open the trade data file in Excel. Graph the market prices and your trades as you traded over the day. Which trades had the largest impact on your results?
- 3) Optional: You are now a market maker/liquidity provider trying to make a profit from “capturing” the bid-ask spread. In other words, you make a “two-way market” entering

buy and sell limit orders for 99 units. You should always have a quote in the order book on both sides of the market! You have a position limit and cannot go long, or go short beyond **400 units**. Any time your position moves away from zero, you need to reverse the position. Rerun the simulation and set “Orders arrive every **3.0 minutes**”, with the Scenario Number set to **3**. At the end, your position should be **0**.

- a) Did you make a profit? What level of risk did you have? To assess risk, click on the Risk tab to see your **Avg Pos**: Compare your market making results to a colleague’s. Who traded greater volume? Who did better? Why?

 - b) Do you believe your market making and provision of liquidity improved “market quality”? Why or why not?
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