



VOLUME WEIGHTED AVERAGE PRICE

IS IT AN EFFECTIVE TOOL FOR TRADE EVALUATION?

Despite its growth in popularity, VWAP fails to measure the total cost of a trade

Grant Johnsey,
Vice President,
Transition Management,
Northern Trust
Global Investments

Everyone can relate to the phrase “Beauty is in the eye of the beholder.” What one person considers beautiful others may not like at all. This is strangely similar to trade execution. What appears to be a good execution to one person may not look so good to someone else. Just like beauty, best execution is in the eye of the beholder.

With ever increasing scrutiny and fiduciary oversight, the investment community has been in search of the Holy Grail of trading benchmarks. During the last few years, as institutional investors try to get a real understanding of the true cost of implementing a manager or strategy change, Volume Weighted Average Price (VWAP) has been gaining in popularity to measure equity executions. VWAP represents the average price of a security weighted by size. In other words, VWAP is a simple way to calculate the average price of a stock over any given time period.

SIMPLICITY LEADS TO POPULARITY

The main advantage of VWAP is its simplicity. Because of this, the use of VWAP as a measurement tool and execution strategy has soared in recent years. VWAP is both easy to compute and understand.

Comparison against VWAP is also straightforward: An execution price better than VWAP indicates that the security was traded better than the average weighted price, whereas a price

worse than VWAP indicates the opposite. When VWAP is used as a benchmark, the goal of the trader is to equal or even beat the VWAP price of the securities in question. VWAP also encourages disciplined market participation while discouraging market timing (except in instances of guaranteed VWAP when the trader is rewarded for accurate market timing).

Broker-dealers favor VWAP as a benchmark. Again, since VWAP is an uncomplicated benchmark, most VWAP trading strategies are simple and relatively quick to execute. All broker-dealers now possess some form of computer-generated algorithms to assist them or to trade automatically with little trader oversight. VWAP’s popularity has also reinforced certain volume patterns, making it an increasingly easy benchmark to attain. In general, it is difficult to look terrible against the VWAP price because every individual execution is included in the calculation. Therefore, the trader faces less risk of a poor execution versus VWAP.

VWAP EXPLAINED

VWAP is calculated by multiplying the volume at each price level by the respective price and dividing by the total volume. The more volume traded at a certain price level, the more impact that price has on VWAP.

$$\text{VWAP} = \frac{\sum(P_n * V_n)}{\sum(V_n)}$$

where P = price traded;
V = volume traded;
n = number of trades

As an example, consider the following series of trades:

500 shares @ \$10.00
300 shares @ \$10.05
200 shares @ \$10.10

The average price for these three trades is \$10.05, however the VWAP is \$10.035 because more volume was executed at the \$10.00 level than at the \$10.10 price. One of the keys to a successful VWAP trade is anticipating market volume and participating accordingly.

CONTINUED



Market impact and market direction are of little concern to VWAP traders as long as they are participating proportionately with the market.

THE DISADVANTAGES OF VWAP

Ultimately, VWAP has several shortfalls that hinder its use as an effective benchmark. These are discussed in detail below:

- **Increases risk of opportunity cost.** A good VWAP execution will participate in line with market volumes in order to match the average price of the day or time period. The stock could be moving against you over this time period, but the pace of execution would remain unchanged. For example, a buy order will continue to be purchased in line with market volume even as its price moves up, increasing the average purchase price.
- **Does not measure impact cost.** As a stock is impacted by buying or selling, the VWAP also is impacted. Therefore, the resulting VWAP price takes into account this impact. As an illustration, assume that a stock was sold over the course of one day at an average price of \$14.25 versus a VWAP price of \$14.24. At the outset, this execution looks very good against the VWAP – one cent per share (or seven basis points) better. However, if the stock opened at \$18 and closed at \$13 per share, the quality of this execution would be called into question. VWAP cannot identify how much the stock's fall was impacted by the selling activity that day.
- **Ineffective as a benchmark for less liquid orders.** Trading has a greater influence on the VWAP price as the order size increases as a percent of daily volume, which typically is the case for illiquid securities. For example, suppose a trader is the only seller of a stock on a particular day. The execution price will therefore equal the VWAP price, incorrectly indicating no trading costs. Therefore, VWAP is an especially poor measurement tool when liquidity is a factor since impact is not being measured.
- **Results can be manipulated.** The VWAP price of any security changes throughout the trading day as trades are printed in the market. Thus, a trader can increase control of the VWAP by increasing the pace of order execution and participating heavily in the market. This can push the VWAP price to a point where the trader's execution looks better, but it also leads directly to much higher market impact costs. Such gaming can more easily be done as described above with large orders or low liquidity stocks.
- **Emphasizes volume, not price.** A successful VWAP trade participates in proportion to market volumes across all prices, both high and low. Therefore price is of secondary importance to volume. To fully understand VWAP, it is vital to see how a trader attains VWAP.

ATTAINING VWAP

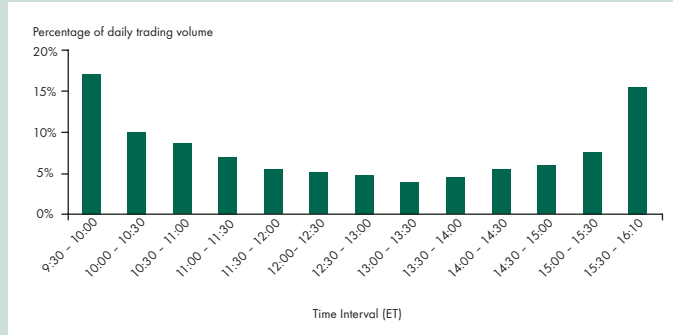
Traders who are being evaluated based on VWAP have just a few simple goals. Their number one goal is to estimate volume profiles of each security without any prior knowledge of that day's volume. In U.S. markets, stocks tend to trade in greater frequency in the morning and afternoon sessions with lower volumes around midday. In European markets, volumes tend to be higher in the afternoon hours when the U.S. markets are open. The following graphs illustrate how these differences typically play out. Using October 2005 as an example, roughly 28% of GE's daily volume occurred in the first hour of trading, versus 10% for Lloyds.

With the volume profile in hand, the trader must then execute in proportion to the volume over each trading time period and adjust participation levels as needed. Any deviation away from market volumes will risk missing the VWAP price. And finally, the trader must minimize the bid/ask spread costs in order to match VWAP.

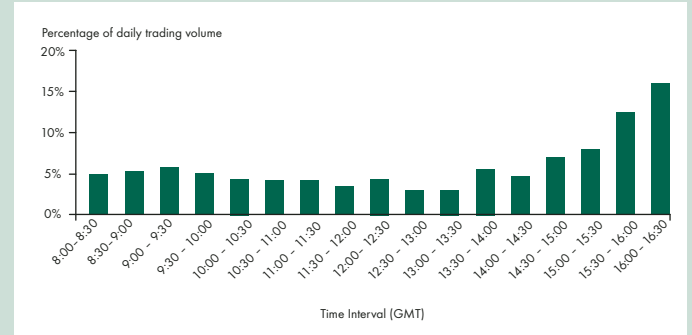
Market impact and market direction are of little concern to VWAP traders as long as they are participating proportionately with the market. While some traders may time the market to beat VWAP, this ultimately adds risk to the trade and fails as often as it works. The only adjustments a trader may make on the fly are to compensate for unexpected changes to the expected volume profile. This may happen during periods of high volatility or when new information is being disseminated into the market.

KNOWLEDGE OF TRADING PATTERNS OF INDIVIDUAL SECURITIES IS KEY TO THE VWAP TRADE

GE TRADING VOLUME ON THE NEW YORK STOCK EXCHANGE



LLOYDS TRADING VOLUME ON THE LONDON STOCK EXCHANGE



Data Source: Bloomberg. Period Represented - October 2005.

VWAP AS A BENCHMARK IN TRANSITION EVENTS

There are certain situations when VWAP can be used to measure transition performance. Specifically, VWAP has some validity in a one-sided trade (buy only or sell only) when opportunity cost is not a consideration. When a stock or portfolio is being sold (or bought) and timing is deemed not to be a consideration, VWAP may be an appropriate measure. As an example, consider a portfolio liquidation where the goal is to avoid any market timing. In this situation, it would be acceptable to work the portfolio over part or all of the day in order to achieve the average price regardless of market movement. However, if timing is a factor, then the previous day's close (when the goal is to exit quickly) or that day's closing price (if the goal is to maintain exposure until the end of the day) would be more appropriate benchmarks.

When a transition encompasses both a legacy and target portfolio, VWAP is an especially poor benchmark. As discussed above, VWAP does not measure market impact or opportunity costs. Consider a situation in which a transition manager executes both the sell and buy portfolios of a transition in an abbreviated period of time. This would ensure that they would be at VWAP or better, since this trading would represent most of the volume, but it would also lead to high market impact. This impact would not show up in the VWAP analysis, but definitely would show up as a cost to the fund in the form of lost economic value. In other words, beating the VWAP price does not necessarily indicate a successful transition because this benchmark fails to reflect the total cost of the event.

SUMMARY

VWAP appears to be emerging as a common measuring stick for best execution in the investment community. The driving force behind this growth in popularity appears to be the simplicity in both understanding and executing VWAP strategies.

Before investors use VWAP as a benchmark, however, it is important to understand when using VWAP is appropriate and to be cognizant of its limitations. Perhaps the most appropriate use of VWAP is to evaluate trades executed in the past when no benchmark was used. In these situations, VWAP provides a simple means of comparing any execution on any day to the average price. Even then, VWAP falls short in many areas, failing to measure market impact or even opportunity costs.

A transition event should be evaluated using an objective benchmark that captures total performance. VWAP fails to consider all of the costs of a transition and can be manipulated as previously discussed. For this reason, the transition management team at Northern Trust generally recommends implementation

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shortfall to measure the effectiveness of a transition trade. Implementation shortfall reflects the total drag in performance attributable to the buying and selling of securities to implement an execution strategy. It represents the difference in return between the actual portfolio and the target portfolio over the course of the transition. This measure not only is objective in its calculation, but also is a true measure of all costs involved. After all, the success of a transition must be evaluated on the basis of all costs, not just a few.

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