Headline: Algorithmic Trading: How execution strategies are used in financial markets	
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Algorithmic Trading: How execution strategies are used in financial markets

The next article in the series of Algorithmic trading looks at how execution strategies and how they can be used in the financial markets

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In the previous article, we went through the steps on how to automate your algorithmic trading strategies. In this article, we will try to understand commonly used execution strategies in the financial markets.

Once an algorithm identifies a trade, it places an order in the market. While we think an order is placed simply by telling the broker the number of shares/contracts (or amount) and the bid-ask price, it is often a bit more complicated than that. In this post, we will go through a few order execution strategies and understand how they can be used in the financial markets.

While a good execution strategy helps all kind of investors, for big and institutional investors, it is almost a necessity. This is because when someone places a huge order to buy or sell thousands to millions of shares, it may impact the market price severely and adversely affect the realized execution price.

Before the advent of algorithmic trading and direct market access (DMA) to institutions, big institutional orders were passed on to the broker and it used to be executed manually over the hours/day(s). This system was susceptible to potential leakages and hence, front-running.

With DMA, more and more institutions have been deploying automated execution strategies directly at their end. Further, automation made the overall execution faster, resulting in reduced slippage in addition to plugging the gaps and potentially improving their realized execution price.

Let's look at the key categories of execution strategies and some examples. Broadly speaking, execution strategies can be:

Impact-driven algorithms: These algorithms aim to reduce the impact of the order on the market price. The order is sliced up into small orders and is placed in the market in such a manner that it has little impact on the prevailing market price.

For example, if the average daily volume of a stock for the past 10 days is 20 million shares, and if we try to place an order of 10 million at once, it will create a large impact on the market with the prices spiking up instantaneously. Instead, if they are divided into tranches of few 100 shares each and then placed in the market based on certain conditions, then the impact on the market price would be far less.

Cost-driven algorithms: The main focus for these algorithms is to minimize the acquisition cost. Here, we aim to get the best price for an asset, without any consideration to any market-driven benchmark price. When we have to place a buy order of 10,000 stocks, then the algorithm will divide the order and place the order when the price/spread of the stock is low.

Opportunistic algorithms: Unlike the earlier type of algorithms, opportunistic algorithms are designed to analyze the changes in the market like price, volume, spreads, etc. which can be used to achieve better execution. In most cases, the algorithm searches the order books to look for liquidity in the asset and trade accordingly.

Let us deep dive into some of the popular execution strategies.

Time-weighted average price strategy: TWAP is a simple strategy which slices the orders into slices which will be executed in fixed time periods.

An example would be to divide the buy order of 10,000 shares into blocks of 500 which would be placed in the market every 15 minutes, resulting in complete execution within the same trading day itself.

TWAP for 'n' periods can be easily calculated by first taking the average of the following: open, high, low and close price for the given period and then taking the average of the previous 'n' periods.

TWAP is one of the oldest order execution strategies and thus, is the most analysed of the different strategies. The major drawback of this strategy is the defined pattern of the orders which can be easily deduced by others, and with the rise of algorithms that are continuously monitoring all kinds of patterns, it may not give desired results if used in plain vanilla fashion.

Some variations of it can include keeping the number of blocks 'not fixed'. One can also go for an aggressive strategy that executes most of the target volume initially so that the overall impact over the course of execution is limited.

Once the bulk of the shares are bought, orders can be eased up and you can continue with the execution slowly, till you have exhausted your order.

Volume-weighted average price strategy: VWAP is simply a ratio of the value traded to the total volume traded during a particular time period. VWAP is a highly popular execution benchmark used by market participants from across the globe. The main aim of VWAP is to trade in line with the market volume so that the impact cost is low.

VWAP can be calculated by first multiplying the volume traded in a given time interval at each price level with the respective price. Dividing the sum of all these products by the total volume traded during that time period gives you the VWAP. In terms of formula, it can be simply given as below:

VWAP = Σ (Number of shares traded * share price) / Total shares traded

The traders can use the Volume weighted average price as a benchmark to check if the execution price they realized was better or worse than the market.

Percentage of volume strategy (POV) is similar to the VWAP except we specify, as the name suggests, the order size as a percentage of the volume. In this strategy, we can go with the flow and keep the order such that it is in sync with the volume in the market.

In comparison to VWAP, which is more dependent on the historical data, the POV strategy is more dynamic in nature and thus, has fewer chances of being able to be predicted by other algorithms and hence, relatively less vulnerable.

These are just a few of the popular execution strategies that are widely deployed, in the standard format or the variations, by traders using algorithms and thus, optimising their realized execution to enhance strategy returns.

In the upcoming articles, we'll be covering various types of trading strategies and implementation aspects related to them. All in the hope that it helps all who are looking to #GoAlgo!

The author is the co-founder of QuantInsti, an Algorithmic trading training institute that offers Executive Programme in Algorithmic Trading (EPAT) and interactive self-paced courses through Quantra.

This article is part of a series where we will be covering various aspects of Quantitative & Algorithmic Trading, including the strategies across various asset classes, techniques, infrastructure requirements, regulations and skills required in this domain.