



## Algorithmic Trading

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### Algorithm

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It is a set of instructions which a computer is programmed to follow in order to carry out a particular task. In the case of trading, advanced mathematical tools are used for facilitating transaction and decision making in the financial market, the need for a human trader's intervention is minimized and thus the decision making is very quick. This enables the system to take advantage of any profit making opportunities arising in the market much before a human trader can even spot them.

#### The common trading strategies used in algo-trading are:

- **High Frequency Trading (HFT):** It involves placing a large number of trade orders across multiple markets and decision parameters at a very high speed, based on preprogrammed instructions.
- **Trend Following Strategies:** It follow trends in moving averages, channel breakouts, price level movements and related technical indicators. These are the easiest and simplest strategies to implement through algorithmic trading because these strategies do not involve making any predictions or price forecasts.
- **Arbitrage Opportunities:** Buying a dual listed stock at a lower price in one market and simultaneously selling it at a higher price in another market offers the price differential as risk-free profit or arbitrage.
- **Mathematical Model Based Strategies:** A lot of proven mathematical models, like the delta-neutral trading strategy, which allow trading on combination of options and its underlying security, where trades are placed to offset positive and negative deltas so that the portfolio delta is maintained at zero.
- **Trading Range (Mean Reversion):** It is based on the idea that the high and low prices of an asset are a temporary phenomenon that revert to their mean value periodically. Identifying and defining a price range and implementing algorithm based on that allows trades to be placed automatically when price of asset breaks in and out of its defined range.
- **Volume Weighted Average Price (VWAP):** This strategy breaks up a large order and

releases dynamically determined smaller chunks of the order to the market using stock specific historical volume profiles.

- **Time Weighted Average Price (TWAP):** It breaks up a large order and releases dynamically determined smaller chunks of the order to the market using evenly divided time slots between a start and end time.
- **Implementation Shortfall:** It aims at minimizing the execution cost of an order by trading off the real-time market, thereby saving on the cost of the order and benefiting from the opportunity cost of delayed execution. The strategy will increase the targeted participation rate when the stock price moves favorably and decrease it when the stock price moves adversely.

## Advantages of Algo-trading

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- There is no time lag, as soon as the signal gets generated, the order gets executed.
- Manual transactions take time as first trigger/signal is received, and then brokerage account is opened to enter the order.
- Human emotions are not involved. Hence, removing last moment dilemma and time lag.
- Retail investors may avoid booking the loss due to the phenomenon called loss aversion.
- Positions can be scaled up, if a profit is made on previous trade, a percentage of it can be deployed in the next trade. Thus, even position sizing can be automated.

## Technical Requirements for Algo-trading

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- Implementing the algorithm using a computer program is the final component of algorithmic trading, accompanied by backtesting (trying out the algorithm on historical periods of past stock-market performance to see if using it would have been profitable).
- Computer-programming knowledge to program the required trading strategy, hired programmers, or pre-made trading softwares.
- Network connectivity and access to trading platforms to place orders.
- Access to market data feeds that will be monitored by the algorithm for opportunities to place orders.
- The ability and infrastructure to backtest the system once it is built before it goes live on real markets.
- Available historical data for backtesting depending on the complexity of rules implemented in the algorithm.

## Issue Involved

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- It is more popular among institutional investors across the world than retail investors.

The technology required to carry out this form of trading is not easily accessible to small-time investors. Accessibility of stock exchange data is limited.

- **HFTs'** unfair access through **co-location** servers placed at the site of exchange, speeds up algorithmic trading leading to **front-running**.
- Retail investors feel the impact of HFT. In the time that it takes for an investor to execute a buy or sell order, an HFT system can execute multiple trades and benefit from the final price entered by the investor.
- It increases market volatility since even a small fall in the market can trigger a mass sell order, leading to a crash.
- At present, there are no defined rules regarding algo-trading for retail investors.
- However, the practice of algorithmic trading is not that simple to maintain and execute. If one investor can place an algo-generated trade, so can other market participants. Consequently, prices fluctuate in milli and even microseconds.
- There are additional risks and challenges such as system failure risks, network connectivity errors, time-lags between trade orders and execution, and most important of all, imperfect algorithms. The more complex an algorithm is, the more stringent **backtesting** is needed before it is put into action.