Algorithmic trading

Algorithmic trading (automated trading, black-box trading, or simply algo-trading) is the process of using computers programmed to follow a defined set of instructions for placing a trade in order to generate profits at a speed and frequency that is impossible for a human trader (Shobhit Seth, n.d.). There are two advantages that algorithmic trading has over human traders.

* It can react to the event on the market much faster than people.
* It execute certain algorithm, set of rules or model without emotional influences

The algorithms are used in more and more areas in financial sector and they can help with all aspects of financial market, from market making, placing orders, determining market clearing opening prices to regulating market. Historically, computerization of market started at the New York Stock Exchange with computerization of order flow in the early 1970s. Later this computerization expanded to the other areas of the stock exchange. Computerization of the stock exchanges allowed the use of algorithms to monitor and evaluate market movement and suggest trades. One of the greatest encouragements for the adaptation of algorithmic trading came with IBM’s paper in 2001 where the researchers evaluated two algorithmic strategies and showed that these two strategies could consistently out-perform human traders (Das, Hanson, Kephart, & Tesauro, 2011). From that moment the amount of algorithmic trading is constantly increasing. It is estimated that algorithms perform between 70%-80% of transactions in US and European stock exchanges.

As we previously mention, algorithms could do multiple things on a stock market and monitor different things in order to evaluate when to trade or not. Algorithms could perform quite simple evaluations such as buying certain amount of stock when its 50-day moving average goes above the 200-day moving average. This is fairly simple example, however, program that executes this could be quite complex, because it has to monitor all the stocks on the stock exchange in real time and calculate moving averages. Also, program needs to have access to stock exchange so it can place orders. There are also a number of other challenges regarding computations, network access, data access, security, etc. This program also needs to be well tested in a sandbox environment where the market is simulated, before the program can start operating with real money. It is interesting to mention that a glitch in the trading algorithm of a hedge fund caused 2010 Flash Crash in which over the minutes one trillion dollars of market value disappeared. Luckily, in 36 minutes market recovered (Kirilenko, Kyle, Samadi, & Tuzun, 2014).

A special case of algorithmic trading is high frequency trading. High-frequency trading is a type of algorithmic trading characterized by high speeds, high turnover rates, and high order-to-trade ratios that leverages high-frequency financial data and electronic trading tools. High-frequency traders move in and out of short-term positions at high volumes and high speeds aiming to capture sometimes a fraction of a cent in profit on every trade. Positions in high-frequency trading can be as short as one millisecond. In order to achieve fast transactions, without any latency, companies move their server and data center as close as possible to the stock exchange. In order to connect with stock exchange, they use fiber cables, which can transfer data in a speed of light. Strategy of moving data centers close to the stock exchange in order to have minimal latencies is called colocation. However, this kind of trading is more risky than buy and hold strategies. Although there is a high risk, Virtu Financial, for example reported that during five years the firm as a whole was profitable on 1,277 out of 1,278 trading days (COMMISSION, 2015).

With the advances of machine learning and artificial intelligence field, there are more opportunities to build models that can evaluate and predict future prices and movements of the market. These models can even adapt to market changes. There are already a number of machine learning papers in academia that show successful use of machine learning in predicting price and market movements. It is also indicative that Goldman Sachs has more than 25% of employees in technology sector and Goldman Sachs Chairman and CEO Lloyd Blankfein stated for Bloomberg that Goldman Sachs is a technology company (Blankfein, 2015). Other firms are also moving more and more towards technology, which indicate that they have seen an opportunity to benefit from the technology and algorithmic trading. The role of quants whose job is to create new algorithms for trading is becoming more important than ever.

# Works Cited

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