THE MACHINE PREDICTED MARKET

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ABSTRACT: Today the people are getting more and more dependent on machines, from retail to media and from finance to security we have been taking help of machines everywhere. And today with more and more research on Machine Learning they are making our jobs more and more easier even they have started thinking for us. Such is the case with Finance industry, the machines are being used to predict the future of the stocks and they have been doing it far better than the best of investors in the Wall Street.But, sometimes they also fail and people have to pay for their failure. This paper represents a comprehensive review of how the Machine predicted or so called Algorithmic Trading works, its working models and its failure along with its future.

KEYWORDS: Algorithmic Trading, Stocks, Machine Learning, Assets, Prediction.

1. INTRODUCTION

Traders have been increasingly using machines for trading since long and the complexity and the efficiency of the algorithm is what help them make money. The more efficient and complex the algorithm will be, more will be the chances of right prediction of the market. And since it is the easy way out more and more people are moving towards Algorithmic Trading. In 2009 about 50 to 60 percent of the stock market was controlled by these systems and today about 75% of the stocks in the U.S are traded by automated trading system. Today about 2% of the firms in the U.S use algorithmic trading but these firms account over 75% of the equity[2]. Even the 60 percent of U.S equity volume is controlled by machine learning and grid computing[1]. This marketing strategy is used by High frequency traders who purchase and sell stocks at very high speeds which is generally in milliseconds and therefore the processing speed of the computer and the internet speed are also the factors on which their trading lies.
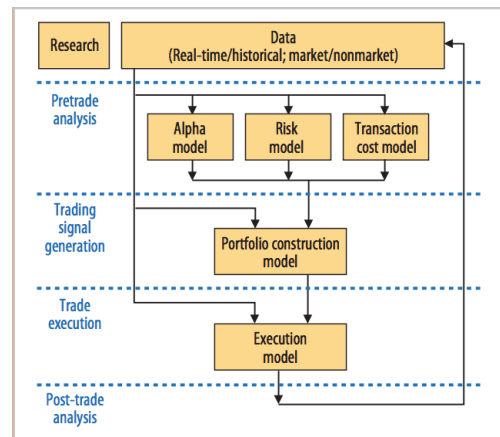
2. ALGORITHMIC TRADING

There are basically two types of algorithmic trading, first being high frequency trading (HFT) and the other one being market making (MM). The high frequency trading is holding the stocks just for a short period of time (generally in microseconds) and then selling it, this is done by strong computer systems and being as close to the market as possible as the speed of transaction plays a big role in this, the more far will be the computers the more time will it take to transact the stocks from the market. Therefore, firms spends millions of dollars on the location and their computers and their networks just to get extra milliseconds for their transaction. In the market the fibre optic cable is considered to be a slower way for communication so they introduced microwave network for the transmission of information. The speed is the main factor in this trading so the traders spend billions of dollars in technology just to reduce the latency.

The second one that is market making provide liquidity in the market, the market makers quote buy and sell price of the stock in the market and take a profit percentage. Although they are not exclusive many HFT are also market makers.

3. TRADING PROCESS

The best way to define algorithmic trading is by explaining different processes that are automated in a life cycle of a trade . Algorithmic trading can be used at any stage of the trading process and for various purposes, including market making, spread trading (also known as relative value

or basis trading), arbitrage, and macrotrading. Algorithmic trading therefore covers a wide variety of systems. In trade-execution programs, for example, the algorithm might decide aspects such as timing, price, and the order's quantity splits. Other systems might automate the complete trading process.

a. Pre Trade Analysis - Algorithms are used mostly in this stage of the process, firstly the previous data and new of the stock is fully analysed and then it gives the prediction of the future price of it. This further has three categories in it that are : Fundamental analysis, Technical analysis and Quantitative analysis.

(i) Fundamental analysis is the study of the stock related to the price and the assets of the company or the potential asset value. The information includes the two countries situation of economy that include unemployment figures, interest rates, gross domestic product, or national policies. These make the signals for the trade when the value of the stock currently differs from the predicted value using the analysis by the algorithm of ratios, such as the price-to-earnings ratio. Statistics and Machine learning have been used to check the relation of the stock value at the particular time and predicted by the computer with aim to identify the stock which have high chances of growth.

(ii) Technical analysis is used to predict the future of price of the stock by collecting all it's history of price and the movements at different times and even trade volume. Many of these analysis are based on the premise that the trade prices change in a particular trend, hence they make a particular entry signal when they find a particular new trend and an exit when it ends. Nowadays more and more complex algorithms are being used to study these trends using genetic programming and neural networks.

(iii) Quantitative analysis takes random prices of assets. Although the previous ones use mathematical and statistical models to predict the pricing this model is different from both of them, this generates an entry signal when there is difference between the predicted and the fair price of the asset.

b. Trade Signal Generation - In the following step of algorithmic trading automated actual trading signals are produced. This is normally done by the trading institution. Although there is little difference between the pre trade analysis and trade signal generation but generally the trade signal generation comes out with a possible outcome of price and even quantity sometimes and even include risk management such as stop loss. Unlike the pre trade analysis the trade signal generation comes out with a fair value of a trade and value. As it gives value

and quantity the complexity of the algorithm also increases with it. Pre trade analysis overlaps trading signal generation in providing a recommendation

(i) Entry Strategies - Just to make a entry signal an entry strategy is required to be made by the algorithm. This can be thought as a fixed profit which is thought before investing in simple language. This is the actually thought difference between the predicted and the actual price in the market using the algorithm. Or, the trader can choose starting point of any trend as the entry point for trading. But to make the most out of these strategies more complex algorithms are required, this gives us the maximum output. Therefore a large set of additional rules are applied instead of using the simple rule for entry point, but forming these rules and applying them in the algorithms is a big task in itself.

(ii) Exit Strategies - This is the most important strategy for every trader, as in this the trader has to select when to exit with how much profit or even sometimes exit with loss. Mostly, this depends on the strategy of the system which is trading. Sometimes a strategy keeps the asset open until it's value reaches the desired target but have to settle for a loss is the trend proves the entry to be wrong. These are generally made by a stop-loss order - that means , the order the order of asset is bought(or sold) once the price has become over (or fallen below) a specified value.

(iii) Risk Management - There's a risk at every level in trading in the stock market so, even in algorithmic trading the risk has to be managed, infact in this it is to be taken very seriously as a simple mistake could lead to huge losses. Therefore, the system must manage to calculate the risk and invest accordingly when to make entry and when to exit in a particular asset. The most common method for this is fixed amount, in which a fixed amount is placed in every trade. But this also has it's disadvantages as it does not distinguish between periods of high and low volatility.

c. Trade Execution - As the trade signal is implemented, the algorithmic trading must take decisions on the cost of transaction and the time used for transaction. To make a investment, an order is given to the trading venue along with the size of order. If the order is too big to be executed in a single time the order is broken down into several orders over a period of time and then executed just to minimise the impact on the market. Or the order is given in different markets such as crossing networks or dark pools in which the order is not publicly

revealed in the current order book. The computer should also determine should it execute the order immediately, or submit order after some time to get a better value.

4.   Advantages of Algorithmic Trading -

As the algorithmic trading is used more largely than the manual trading, this is because it has many advantages.

(i) The first and the foremost advantage of algorithmic trading is it's speed, it trades in stocks in microseconds. Which is faster than even what humans can think.

(ii) This type of trading can keep a check on multiple indicators of a trade at a single time which humans can't even think of. As the things are analysed very fast and accurately there are chances of getting the asset at a more better price.

(iii) The best thing of this is it's accuracy at which it trades. If the algorithm in the computer is made properly it cannot make any mistake of choosing a wrong stock at a wrong time which a human commonly does as the trade is checked twice before making an order.

(iv) Emotions, which a machine doesn't have becomes an advantage in this work, as the humans get easily influenced and this can lead to irrational decisions.

(v) Another advantage is reduced transactional cost. In this people do not have to spend more money on transactions as most of them are done automatically by the machines and only they have to sometimes keep a check on them, unlike keeping a constant check on the market.

(vi) Speed: Algorithms are composed previously so you can execute the guidelines naturally. The principle advantage of doing this is speed. The speed is fast to the point that as a person, it is hard to take note. You can filter and execute different pointers at a quick speed that is hard to spot. This empowers exchanges to be broke down and executed quicker and give better chances.

(vii)   Accuracy: Exactness is critical in algorithmic exchanging. Much the same as each different business or exchange, precision is a key to better outcomes. With the utilization of PCs in exchanging, it would help in diminishing a few oversights that may normal be related with completing that equivalent movement physically. On the off chance that you are exchanging physically, you can erroneously purchase the wrong money combine for the wrong sum. On account of utilizing a PC calculation, there is next to zero space for mix-up. Human feelings assume an enormous job in exchanging however with algorithmic, there is no space for that. People regularly escape with their powerless feelings that frequently prompts settling on unreasonable choices. It causes you expel any mistakes previously you can begin exchanging

the live market. Manual exchanging leaves a considerable measure of space to escape by covetousness and overpowering by dread.

(viii)   Cost reduction: The last yet not the minimum is the way that you would not be at the danger of losing your income. You don't need to invest a considerable measure of energy checkmating the business sectors as exchanging should be possible without your steady supervision. The time spent on checking the market is radically decreased and gives you the chance to participate in different exercises

(ix) To exchange precisely, algo exchanging lets you backtest. It's an immense errand for merchants to know the example of exchanging framework that works appropriately and the procedure that doesn't work for them. Calculation exchanging would empower you to look backtest the frameworks that fizzled and worked. This would enable you to make more wage and lessen the danger of losing money.

5.   Drawbacks of Algorithmic Trading -

As everything has it's disadvantages, this trading is not different, it also has some disadvantages.

(i) The foremost disadvantage of this trading is cost. The firms supporting this require large capital as the technology demands are way too high for this. The traders want the systems to be as near to the wall street as possible, and the wall street is among the most expensive places in the world. The best of processors and fast and stable internet connection is required, and the traders are ready to spend as much money required to get the most of it.

(ii) Another disadvantage is the lack of control. Although the machines trade automatically but still they require some control because if something goes wrong and they work in the way you don't want them to they can cause big loss to the trader. Therefore they must be tested very thoroughly before using in the real market to avoid making mistakes.

(iii) The Biggest Risk: Amplification of Systemic Risk
One of the greatest dangers of algorithmic HFT is the one it postures to the money related framework. A July 2011 report by the International Organization of Securities Commissions (IOSCO) Technical Committee noticed that in view of the solid between linkages between monetary markets, for example, those in the U.S., calculations working crosswise over business sectors can transmit stuns quickly starting with one market then onto the next, in this manner enhancing foundational hazard. The report indicated the Flash Crash of May 2010 as a prime case of this hazard.
The Flash Crash alludes to the 5%-6% dive and bounce back in major U.S. value records inside the range of a couple of minutes on the evening of May 6, 2010. The Dow Jones dove just about 1,000 points

on an intraday premise, which around then was its biggest focuses drop on record. As the IOSCO report takes note of, various stocks and trade exchanged assets (ETFs) went haywire that day, tumbling by somewhere in the range of 5% and 15% before recuperating the vast majority of their misfortunes. More than 20,000 exchanges 300 securities were done at costs as much as 60% far from their qualities unimportant minutes sooner, with a few exchanges executed at silly costs, from as low as a penny or as high as $100,000. This surprisingly unpredictable exchanging activity shaken speculators, particularly on the grounds that it happened a little more than a year after the business sectors had bounced back from their greatest decreases in over six decades.

(iv) Did "Satirizing" Contribute To the Flash Crash?
What caused this peculiar conduct? In a joint report discharged in September 2010, the SEC and the Commodity Futures Trading Commission stuck the fault on a solitary $4.1-billion program exchange by a dealer at a Kansas-based common store organization. Be that as it may, in April 2015, U.S. specialists charged a London-based informal investor, Navinder Singh Sarao, with market control that added to the accident. The charges prompted Sarao's capture and conceivable removal to the U.S. Sarao supposedly utilized a strategy called "ridiculing," which includes putting in substantial volumes of phony requests in an advantage or subsidiary (Sarao utilized the E-smaller than expected S&P 500 contract upon the arrival of the Flash Crash) that get dropped before they are filled. At the point when such huge scale false requests appear in the request book, they give different dealers the feeling that there's more noteworthy purchasing or offering enthusiasm than there is in all actuality, which could impact their own exchanging choices.

For instance, a spoofer may offer to offer countless in stock ABC at a value that is somewhat far from the current cost. At the point when different merchants bounce in on the activity and the cost goes lower, the spoofer rapidly drops his offer requests in ABC and purchases the stock. At that point the spoofer puts in an extensive number of purchase requests to drive up the cost of ABC. What's more, after this happens, the spoofer offers his property of ABC, taking a clean benefit, and drops the fake purchase orders. Do this process again.

Many market-watchers have been suspicious of the case that one informal investor could have without any help caused an accident that wiped out near a trillion dollars of market an incentive for U.S. stocks inside minutes. In any case, regardless of whether Sarao's activity really caused the Flash Crash is a point for one more day. In the interim, there are some substantial reasons why algorithmic HFT amplifies fundamental dangers.

(v) For what reason Does Algorithmic HFT Amplify Systemic Risk?

Algorithmic HFT intensifies fundamental hazard for various reasons.

Strengthening Volatility: First, since there's a lot of algorithmic HFT action in present-day markets, endeavoring to outfox the opposition is an in-fabricated characteristic of generally calculations. Calculations can respond quickly to economic situations. Thus, amid wild markets, calculations may extraordinarily enlarge their offer ask spreads (to abstain from being compelled to take exchanging positions) or will incidentally quit exchanging out and out, which lessens liquidity and worsens unpredictability.

Progressively outstretching influences: Given the expanding level of joining among business sectors and resource classes in the worldwide economy, an emergency in a noteworthy market or resource class regularly swells crosswise over to different markets and resource classes in a chain response. For instance, the U.S. lodging market crash caused a worldwide subsidence and obligation emergency in light of the fact that considerable property of U.S. sub-prime paper were held not simply by U.S. banks, yet additionally by European and other budgetary organizations. Another case of such progressively outstretching influences is the negative effect of China's securities exchange crash, and also the fall in raw petroleum costs, on worldwide values from August 2015 to January 2016.

(vi) Vulnerability: Algorithmic HFT is a striking supporter of overstated market instability, which can feed financial specialist vulnerability in the close term and influence customer certainty over the long haul. At the point when a market all of a sudden crumples, financial specialists are left pondering about the explanations behind such a sensational move. Amid the news vacuum that frequently exists at such occasions, expansive brokers (counting HFT firms) will slice their exchanging positions to downsize chance, putting all the more descending weight on the business sectors. As the business sectors move lower, more stop-misfortunes are enacted, and this negative input circle makes a descending winding. In the event that a bear showcase creates on account of such action, shopper certainty is shaken by the disintegration of securities exchange riches and the recessionary signs exuding from a noteworthy market emergency.

(vii) Different Risks of Algorithmic HFT
Errant Algorithms: The stunning pace at which most algorithmic HFT exchanging happens implies that one errant or broken calculation can pile on millions in misfortunes in a brief period. A notorious case of the harm that an errant calculation can cause is that of Knight Capital, a market producer that lost $440 million of every a 45-minute time span on August 1, 2012. Another exchanging calculation at Knight made a large number of flawed exchanges around 150 stocks, getting them at the higher "ask" cost and

in a flash offering them at the lower "offered" cost. (Note that showcase producers purchase stocks from speculators at the offered cost and pitch to them at the offer value, the spread being their exchanging benefit. For additional, read: The Basics of the Bid-Ask Spread). Shockingly, the hyper-proficiency of algorithmic HFT - wherein calculations always screen markets for simply this kind of evaluating inconsistency - implied that match dealers swooped in and exploited Knight's quandary while Knight representatives wildly attempted to segregate the wellspring of the issue. When they knighted, had been pushed near chapter 11, which prompted its inevitable procurement by Getco LLC.

(viii)   Immense Investor Losses: Volatility swings compounded by algorithmic HFT can saddle speculators with enormous misfortunes. Numerous speculators routinely put in stop-misfortune requests on their stock property at levels that are 5% far from current exchanging costs. In the event that the business sectors hole down for no obvious reason (or notwithstanding for a valid justification), these stop-misfortunes would be activated. To make an already difficult situation even worse, if stocks in this manner bounce back in short request, financial specialists would have unnecessarily caused exchanging misfortunes and lost their possessions. While a few exchanges were switched or dropped amid abnormal episodes of market instability like the Flash Crash and the Knight disaster, most exchanges were definitely not. For instance, a large portion of the almost two billion offers that exchanged amid the Flash Crash were at costs inside 10% of their 2:40 PM close (the time when the Flash Crash began on May 6, 2010), and these exchanges stood. Just around 20,000 exchanges, including an aggregate of 5.5 million offers that were executed at costs over 60% far from their 2:40 PM cost, were in this way dropped. So a financial specialist with a $500,000 value arrangement of U.S. blue-chips who had 5% stop-misfortunes on her situations amid the Flash Crash would in all probability be out $25,000. On August 1, 2012, the NYSE dropped exchanges six stocks that happened when the Knight calculation was going crazy since they were executed at costs 30% above or beneath that day's opening cost. The NYSE's "Obviously Erroneous Execution" rule expresses the numerical rules for inspecting such exchanges. (See: The Perils of Program Trading).

(ix) Loss of Confidence in Market Integrity: Investors exchange monetary markets since they have full confidence and trust in their honesty. In any case, rehashed scenes of surprising business sector unpredictability like the Flash Crash could shake this certainty and lead some preservationist financial specialists to relinquish the business sectors inside and out. In May 2012, Facebook's IPO had various innovation issues and deferred affirmations, while on August 22, 2013, Nasdaq quit exchanging for three hours because of an issue with its product. In April 2014, near 20,000 wrong exchanges must be dropped following a PC breakdown at IntercontinentalExchange Group's two U.S. choices trades. Another real explode like the Flash Crash could incredibly shake speculators' trust in the respectability of business sectors.

On 6th of May, 2010 the U.S market dropped more than 5 percent all of a sudden but recovered most of it in about an hour or so. This event was called a "Flash Crash" as the market fell of all of a sudden. There was a survey conducted by ishares/ Blackrock (http://www.cftc.gov/About/ CFTCCommittees/CFTC…/cftcsecac_archardstudy .pdf). In which it was found that about 46 percent of the investors thought HFT(High frequency trading) was the cause of this crash. While there were some who studied the inventories of the HFT traders and found out that Flash Crash was not caused by them. This Crash affected a lot of investors as the trades were cancelled which were below 60% of the 2:40 p.m ET price, and the investors whose prices did not meet that criteria lost a lot of money.

Generally the market becomes more and more delicate because of the imbalance in the large number of orders in the HFT. These, sometimes get out of control and the market makers are unable to handle it, this becomes the reason for a market crash. Since the market is getting more and more automated these days some rules and regulations are required to be safe from these events happening again. Therefore some talks are being done to regulate the algorithms by the regulators.

6. THE FUTURE

It's quite difficult to predict the future of a thing which itself is doing the same thing. Still as algorithmic trading reduce human burden in keeping a constant check on all the stocks people are definitely going to use it. Ultra high frequency trading has already started in which they buy and sell stocks at extremely fast speed with powerful computers and internet connection. By the help on complex algorithms these computers apply the best of strategies to choose the best stock and best time to enter and exit. Thousands of orders are executed in microseconds. As machine learning and artificial are being used in it these are becoming more and more reliable, since you now don't even have to keep a check on them. As like others Self driven cars, drones and automation this cannot be left away. Although the future is still uncertain but it is sure that it is going to be amazing with newer technologies coming in like microwave wires used instead of optical cables.

7. CONCLUSION

With it's benefit's of being accurate and being fast than other forms of tradings it is very unlikely that this will stop rather this seems to have a very bright future in the modern market and many big firms are investing a lot of money in it. As per the crash is concerened it is still uncertain it was due to this HFT. Even we don't even know that it is harmful or good for the market. A person who is still marketing in the old fashioned way will always have a disadvantage over the high frequency trader who is using the best of computers and technology to trade in market. Some people are still arguing about "fact is technology will always add opportunities for smart people to find new ways to profit. The problem isn't the intent to profit, the problem is the impact on others who aren't so smart or simply don't have access to the technology." But still to be secure regulations should be added to it so that there's minimum risk of a crash in the market and minimum loss of traders.

Even the trend of the Algorithmic trading is found to be irreversible in the U.S, infact it is spreading in other parts of the world as well. But the government is finding it a little difficult to regulate this, the government must protect all the small investors along with keeping the game fair for all the investors in the market. Regulating the rules is very important and keeping a check on the algorithms used by the companies, even there has been cases of algorithms being stolen by one company from other. There must be a system of algorithms being copyrighted and strictly being kept confidential among the company itself.

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