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IMPLEMENTING AUTOMATED ALGORITHMIC COMMODITY TRADING USING PYTHON

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Abstract

All the main stock and commodity exchanges throughout the world are using electronic trade execution systems which have opened up doors for use of automated trading program within the business insight frameworks for any money related or investment company. This kind of automated trading systems can rule out the negative impact of human emotions such as fear and greed on trading activities. Various online trading platforms are also motivating traders to use such automated system by providing them interface, technical support and allowing them to integrate third party software and tools with their trading platforms. To design such reliable automated trading systems which can use predefined strategies and can place high frequency trades, is becoming a challenge. In this paper an automated algorithmic trading application has been implemented using a price action strategy and tested in real time commodity exchange (MCX).

I. Introduction

Before the evolution of electronic trading, the trading of stocks used to be a paper-based activity. There used to be physical stock certificates and the buyer and seller were required to be physically present there for trading the stocks. After that the era of dematerialization (DEMAT) was evolved. Physical certificates were replaced with the electronic form and buying selling of the stocks was done by registering or transferring electronically. The result of this was more fluctuations in the stock-prices due to faster execution of trade. Now due to technological developments the era of ALGORITHM TRADING has begun. Now, an algorithm can be written in advance to instruct a computer through a program to buy or sell stocks based

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on pre-defined conditions. With these program-based trading, the speed and frequency of trades can be so rapid which is inconceivable for human broker. The algorithmic trading process can either be fully automated for semi-automated. Thus, the process is termed as automated algorithm trading. It is becoming one of the popular areas in the world on stock market. It establishes explicit standards for trade entry and exit that can be consequently executed by the computer once programmed. The U.S. stock exchange traded roughly about 75% of shares via automatic trading systems [1]. A detailed review studies was carried out on trading systems constructed utilizing different techniques and observationally assessed the strategies by gathering them into three kinds: technical analysis, textual or fundamental analysis and high recurrence trading. The preferences and drawbacks of each methods was also evaluated and their future prospects were assessed and was discovered the most ambiguous and important research areas in regions of these two sorts, in which the factual method PST, AI applications and textual analysis were featured. [2], which became the inspiration for this study.

II. Commodity Trading

A commodity market could be a physical or virtual commercial center for purchasing, offering and trading unrefined or essential items, and starting at now there are around 50 significant commodity markets far and wide that empower speculation exchange of approximately 100 essential commodities like grain, precious metals base metals, oil and natural gas etc. "The commodity market has a special tool which is used for managing the risks related to the price fluctuation in the market" [3].

For virtual trading of commodities in India, Multi Commodity Exchange of India Ltd. (MCX) s an autonomous commodity exchange n Mumbai and was set up in the year 2003. The MCX is India's biggest commodity exchange and the turnover of the exchange for quarter finished in 30 June 2019 was 110.84 crore rupees. The MCX has secured third position as the world's biggest commodity exchange is unrefined petroleum fates. With such a growing market more and more people are interested in Trading in commodities like crude oil.

While trading in the commodity market most of the trader's trade manually by themselves or by seeking advice from other sources which may lead to a very risky investment as they lack the basic understanding of how the commodity market works. "In manual trading the user is required to place an order telephonically or physically to the broker or online using some web trading platform provided by their broker" [6].

Online manual trading may pose following problems:

Manual Traders can be affected by behavioral biases, making them settle on nonsensical choices and trade on feelings, such as greed and fear. The trader may choose to give the stock run access in the expectation of understanding a significantly bigger benefit or the trader could lose the extra benefits along with a bit of their original investment. In manual trading identifying the opportunities not just requires observing the market for whatever number of hours in the day as could be expected under the circumstances, yet in addition the accessibility to execute the trade in the short window of time for which it introduces itself, due to this the investor may or may not be able to place trades when the market is most advantageous for him due to lack of time or busy work schedule.

III. Automated Algorithmic Trading

Automated Trading is a general phrasing used to describe computerized trading. The computer innovation has reformed budgetary markets, and these days these business sectors are exceptionally subject to computerized reasoning, big data analysis and modelling. "It involves a challenging task of predicting the price movements in the market and is also affected by various factors. There are two models that are used to solve the problem of future price predictions and these are fundamental analysis and technical analysis" [2].

Automated Trading is additionally known as algorithmic or robot trading, where diverse securities are exchanged automatically by computers and it generates an output flag based on information set and strategies. This flag could be produced by an calculation which is essentially a set of rule that a computer program executes in arrangement until a wanted conclusion point, frequently referred to as a technical trading rule [4]. By executing exchanges

quicker and speedier, these speedier developing systems permit exchanging calculations to get data more rapidly than human traders.

An algorithm can be termed as following specific set of steps to transform the input values into an output value based on pre-defined computations. Similarly, trading algorithms can be understood as simply the set of predefined rules to convert input into output. It is therefore, trading algorithms are executed within Automated Trading Systems which facilitate data collection to get input values and to transform output values into an actual action. Black box or algorithmic trading became hugely profitable by the invention of Pair Trading way back in 1980. The main reason for adoption of algorithmic automated trading by traders was improved control mechanisms, reduction in costs, automatic recording of trade details and faster execution. In present scenario, algorithms have become a mainstream aid to the daily trader.

Algorithmic trading deals with complex formulas, mathematical models and human management, for settling on choices identified with purchase and sell of monetary protections on a trade. Algorithmic traders frequently utilize high-recurrence exchanging innovation, which can empower them to make a large number per second. "World's to begin with electronic stock advertise was National Affiliation of Securities Dealers Automated Quotations (NASDAQ) which was set up within the year 1971 and electronic quotation system for competing market makers to trade securities was introduced"[4].

Automated Trading Systems (ATS) play an important role in the Business Intelligent Systems (BIS) of any financial or investment company. ATS has become a need in present condition, for fast versatility to the ever-changing economic situations. The computational and data processing speed is the primary plan necessities of any ATS [4].

The latency of a trade is very crucial in a market here speed is of the essence. Dormancy is the time it takes to complete an arrangement, drop a request or realize what's going on in the market. [5]

IV. Proposed Algorithmic Automated Trading Application

Algorithmic Automated trading application deals with real time and historical price data of a share or commodity and performs the buy/sell

operations of these shares by analyzing the market price using various algorithms" [7].

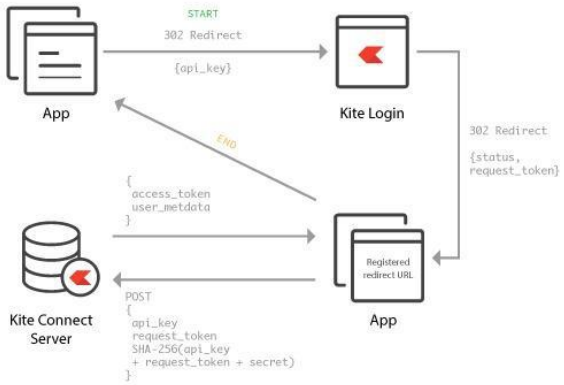

Figure 1. Zerodha Kite Connect Login flow.

Source: https://kite.trade/docs/connect/v3/user/

After placing the order, the system also monitors the live prices and on achieving the pre-defined target profit, it automatically exits from the trade. For handling minimal loss, the Margin Intraday Square-off (MIS) cover order has been used which has inherent property of putting a stop loss order alongside the first purchase/sell order.

The main advantages of using cover order are

• Discipline: It is very important to place a Stop Loss (SL) while Intraday trading but most of the time, traders have a stop loss price in their mind but do not put it on the System. Sometimes it also happens that a trader places a SL order but removes it in a hope of correction if the market starts moving drastically in opposite direction. This kind of human behavior which becomes the reason of huge losses in most of the trades is eliminated if a cover order is placed as a trader is required to compulsorily place a stop loss order within a 1.5% range from the entering price of the stock/contract and cannot remove or cancel SL till trade is exited. This limits the losses of a trader. The SL can be modified, but within the 1.5% range itself.

• Higher Leverage: Since losses are within a fixed range of the trade, it not only limits the losses and risk but also much higher intraday leverage is

provided by the broker compared to regular Margin intraday Squared off (MIS) orders. The leverage provided also depends on the price of stop loss. [9]

The system has been developed using Python language version 3.7 and uses the API of Zerodha discount broker which are being provided to Zerodha Connect monthly subscribers.

V. System Architecture

The architecture for designing an Automated Algorithmic trading system was comprising of following four components to oversee various tasks of the algorithmic trading system [8]:

(i) The data handler:

Structured or unstructured or both data can be used in an Algorithmic Trading system. If the data is sorted out as per some pre-decided structure, for example, spreadsheets, CSV records, JSON documents, XML, Database, and Data-Structures, at that point it is treated as organized information. Generally, advertise related information, for example inter-day costs, end of day costs, and trade volumes is accessible in an organized format.

If data is not sorted out as indicated by any pre-decided structures, such as news, online networking, recordings, and audio then it is treated as unstructured data. It is intrinsically more complicated to process such type of data and requires data mining and data analytics techniques for analysis.

For our application we have used structured historic and live data received from the broker's API.

(ii) Model (Strategy) handler:

A model is the representation of the manual task with Algorithm. To assign the behavior of a human to a program is quite challenging. A number of different methodologies and techniques can be used to construct the model. The main objective of designing the model is to reduce a complex system into a sensible and quantifiable arrangement of rules which depict the conduct of the system in fluctuated situations. Most prevalently utilized methodologies incorporate, however are not restricted to symbolic and fuzzy logic systems, mathematical model, induction rule sets, decision trees and neural networks.

For our application we have used mathematical model which is based on analysis of the behavior of market and is also called quantitative finance model. It is based on the intrinsic expectations that market follows a specific behavior of price movement at a specific time of the day. This has been an extremely helpful suspicion which is at the core of nearly all derivatives cost activity models.

(iii) Trade execution handler:

This component is responsible for execution of identified buy or sell order (trade). For our application the intraday cover order was used which not only allows to place a buy or sell order but also automatically places the stop loss order of pre-defined value. We have used the pre-defined stop loss of 15 points making the risk and reward ratio of 3:5.

(iv) Monitoring handler:

Timely and profitable exit from a trade based on the pre-defined risk reward ratio, is equally important for an automated system. Our application has been programmed to keep monitoring the live data after placing the order and automatically places an exit order when the target profit is achieved.

VI. Result

After implementing the stated strategy on live data for two week, we have made profit on 6 out of 10 Working days. The total profit of (Day2, Day5, Day6, Day8, Day 9, 10) was 150 points and the total loss of (Day1, Day3, Day4, Day 7) was 80 points. At the end of the two week the system generated a profit of 70 points (Rs. 700).

The result is as follows:

Table 1. Two Weeks Result.

Test Period	Point	Result
Day 1	20	Loss
Day 2	25	Profit
Day 3	20	Loss

Day 4	20	Loss
Day 5	25	Profit
Day 6	25	Profit
Day 7	20	Loss
Day 8	25	Profit
Day 9	25	Profit
Day 10	25	Profit

After all the testing the 5:4 ratio has been found as the best ratio for profit and loss.

VII. Conclusion

We have developed an Application with a graphical user interface in Python Programming Language which is capable of 3 main tasks:

- Automatic Trading: This application can trade in Crude Oil Commodity in MCX Exchange automatically with the best tested strategy.

- Historical Data: This can provide you with Historical data of Crude Oil Commodity in MCX Exchange.

- Live Stream: This can show you the stream of the current data of Crude Oil Commodity in MCX Exchange.

The software Automated Algorithmic Trading for Crude Oil Commodity trade on specific strategy has been developed as per the requirement and has been tested in live market for any logical or syntax error and has been found working properly.

VIII. Future Scope

The capabilities of the software can be extended for trading other commodities in MCX. It can also be extended for trading of shares in other stock exchanges. The features can also be added for trading in other commodity exchanges. Different strategies can be tested and implemented in

future and the user will have the option to change the strategy according to their needs.

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