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Algo Trading in Stock Market Using Mean Reversion Algorithm

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ABSTRACT: Algorithmic trading is generally defined as using computer-generated algorithms to create and execute orders on marketplaces. Recently, such algo-trading strategies are increasingly being associated with the negative impact on capital markets – both from a technological as well as a business perspective. However, there are positive effects of algorithmic trading too – such as increased liquidity and the elimination of market inefficiencies – that far outweigh the potential negative effects. Regardless of this, algo-trading has seen increasing popularity and acceptance on most of the major global markets, demanding well thought-out strategies that actually help traders and investors make more than a reasonable return on their investments. Objective of this paper is to: a) Categorize the types of algorithmic trading and describe their implications for capital markets. b) Describe how to accommodate algorithmic trading in markets, while minimizing potential adverse effects. Discuss technology options and architectures to realize the same. c) Describe the use of special-purpose orders in the context of algorithmic trading. Keywords: Algorithmic trading, High-frequency trading, Automated trading, Flash trading Electronic copy available at: https://ssrn.com/abstract=2884777 "Algorithmic trading and its implications on Capital markets" 2 © Sriram Kannan, Dec'14

I. INTRODUCTION

Electronic (capital) markets have become more pervasive and are characterized by a relentless drive towards faster decision making and execution. In view of this, both the developed and emerging markets have seen significant increase in trading volumes through complex algorithms executed on massive computers – more popularly known as 'algorithmic trading' or algo-trading. About seven billion shares exchange hands every day on US equity markets, of which around two-thirds are traded by computer generated algorithms based on quantitative models that crunch mountains of data to predict gains while trying to minimize or reduce risk. Further, almost half of Asia Pacific markets are traded electronically while the emerging markets are slowly catching-up to this trend. Recently, such algo-trading strategies are increasingly being associated with the negative impact on capital markets – both from a technological as well as a business perspective. However, there are positive effects of algorithmic trading too – such as increased liquidity and the elimination of market inefficiencies – far outweigh the potential negative effects. Despite the bad press, it's a fact that high-frequency trading has seen increasing popularity and acceptance on most of the major global markets, demanding well thought-out strategies that actually help traders and investors make more than a reasonable return on their investments.

OBJECTIVE(S) The objective(s) of this paper is to: a) Categorize the types of algorithmic trading and describe their implications for capital markets. b) Describe how to accommodate algorithmic trading in markets, while minimizing potential adverse effects. Discuss technology options and architectures to realize the same. c) Describe the use of special-purpose orders in the context of algorithmic trading.

Problem Definition

To provide a automated rule based system to trade on stock market without physical intervension fully working on programming and cloud computation

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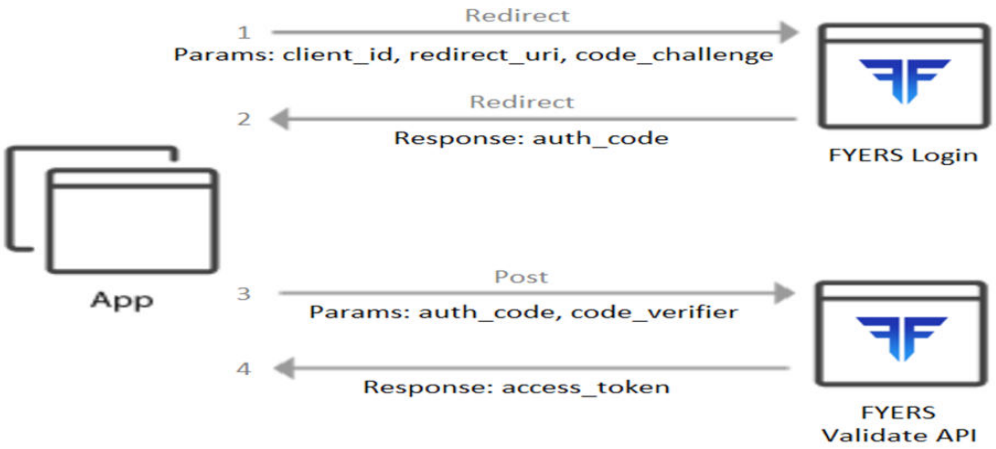
II. DESCRIPTION

What is Algorithmic (or) High-frequency trading? It is the high-speed execution of automated trading strategies, in which large number of trades are conducted in short time spans in order to profit from pricing or other market inefficiencies. In simple terms, it is the use of programs and computers to generate and execute (large) orders in markets with electronic access. Securities and Exchange Board of India (SEBI) has succinctly defined Algorithmictrading as "any order that is generated using automated execution logic." Capital markets are global and inter-connected but vary in size, maturity and technological capabilities. Initially in the early '90s, algorithms were used as proprietary tools by institutional investors in the U.S. to create new markets aside from NYSE and NASDAQ which, has since led to the explosion of highfrequency trading globally. This has resulted in orders pouring from institutional investors, hedge funds and several Wall Street trading desks. In addition to the primary objective of maximizing profits, algotrading helps control execution costs and limit market risks. 2.1.2 Issues faced in Algo-trading Institutional clients usually trade large volumes in equities, forex, fixed-income, commodities, derivatives and emerging market asset classes. These volumes (quantity) and values (trading currency) are often larger than what the market can absorb without impacting the price. Therefore, there is a compelling need for such large orders to be split or sliced into smaller orders to be executed electronically over the course of seconds (even milliseconds!), minutes, and hours in a day, which lends itself as a challenge from both technology selection and architectural (system) design and implementation perspective. 2.1.2.1 Most commonly observed issues are – a) The decision of how to split or slice an order into smaller (tradeable/executable) chunks. b) Order execution strategies and at what prices? c) Choice of algorithms – alpha preserving or alpha creating? d) Choice of technology and architectural components. e) Achieving the 'best possible price' for each of those tradeable/executable orders. f) Creation of dark pools "Algorithmic trading and its implications on Capital markets" 4 © Sriram Kannan, Dec'14 2.1.2.2 Several automated trading worlds There are a number of automated trading venues (markets) and market participants face innumerable challenges that are widely varied and deeply impacted by a range of factors – both internal and external to the exchange. Some of the major trading venues for US Equities are set forth below – g) ARCA-NYSE (ex-Archipelago) – electronic trading platform of NYSE h) Better Alternative Trading System, commonly known as BATSi) Direct Edge j) ISE – International Securities Exchange 3. ASSUMPTIONS The following assumptions form the basis of this paper – a) Technological innovation allows for trading strategies (orders) to be executed rapidly leading to the growth of algo-trading in every market in which it exists. b) Reduced barriers to entry have increased access for new market participants. c) The proliferation of new trading venues (exchanges) creates arbitrage opportunities for algotraders. d) Regulatory changes have led to the introduction of new trading rules (eg: decimalization), which has led to certain price discrepancies.

Programing architecture:



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STRATERGY:

Mean reversion, or reversion to the mean, is a theory used in finance that suggests that asset price volatility and historical returns eventually will revert to the long-run mean or average level of the entire dataset.

This mean level can appear in several contexts such as economic growth, the volatility of a stock, a stock's price-to-earnings ratio (P/E ratio), or the average return of an industry.

We will be choosing only F&O stocks for this strategy. However, the trades are all taken in cash market.

We will be using daily time-frame to filter out the stocks for Intraday trading in those stocks.

This system follows three very simple and basic rules for the entry:

Previous Close Price > 200 SMA

RSI(2) > 50

Today's % Change > 3%

The first rule helps us to find the underlying major trend of the stock. The second rule helps us to find if the stock is overbought or not. The third rule helps us to find if there has been an extraordinary up-move in the stock in a short period of time.

All these three rules helps us in finding whether the stock has reached a level after which it will revert back to its mean or moving average.

1) KEY TAKEAWAYS

Mean reversion, in finance, suggests that various phenomena of interest such as asset prices and volatility of returns eventually revert to their long-term average levels.

The mean reversion theory has led to many investment strategies, from stock trading techniques to options pricing models.

Mean reversion trading tries to capitalize on extreme changes in the price of a particular security, assuming that it will revert to its previous state.

Rule based trading-

A rule based system is one which precisely defines a trade set-up, determines exactly how much money will be placed on the trade (position size), as well as what the risk and profit will be.

Basically, once a trade signal occurs, a stop and profit target are placed (which may possibly be moved based on other rules) and there are no further decisions to make. The trade stays on until either the stop or profit target have been hit, or in the case of binary options, the trade expires.

The simplest rule based system is one where a profit

target and stop are placed at the outset of the trade, and do not move. There is nothing for the trader to do once the trade is on, except wait for the trade to close via the stop, profit target or expiry.

New traders should typically start with this approach. Everything is defined so there is less emotional involvement (although it can still be emotionally difficult to implement a rule based system). It is also possible to "automate" rule-based strategies by writing a program so that it can essentially run without human involvement. Of course this requires coding skills and a deep understanding of the strategy being employed.

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BACKTESTING:

Backtesting is the general method for seeing how well a strategy or model would have done ex-post. Backtesting assesses the viability of a trading strategy by discovering how it would play out using historical data. If backtesting works, traders and analysts may have the confidence to employ it going forward. Backtesting assesses the viability of a trading strategy or pricing model by discovering how it would have played out retrospectively using historical data.

The underlying theory is that any strategy that worked well in the past is likely to work well in the future, and conversely, any strategy that performed poorly in the past is likely to perform poorly in the future.

When testing an idea on historical data, it is beneficial to reserve a time period of historical data for testing purposes. If it is successful, testing it on alternate time periods or out-of-sample data can help confirm its potential viability.

FORWARD TESTING: Forward performance testing, also known as paper trading, provides traders with another set of out-of-sample data on which to evaluate a system. Forward performance testing is a simulation of actual trading and involves following the system's logic in a live market. It is also called paper trading since all trades are executed on paper only; that is, trade entries and exits are documented along with any profit or loss for the system, but no real trades are executed.

An important aspect of forward performance testing is to follow the system's logic exactly; otherwise, it becomes difficult, if not impossible, to accurately evaluate this step of the process. Traders should be honest about any trade entries and exits and avoid behavior like cherry picking trades or not including a trade on paper rationalizing that "I would have never taken that trade." If the trade would have occurred following the system's logic, it should be documented and evaluated.

Many brokers offer a simulated trading account where trades can be placed and the corresponding profit and loss calculated. Using a simulated trading account can create a semi-realistic atmosphere on which to practice trading and further assess the system.

The figure above also shows the results for forward performance testing on two systems. Again, the system represented in the left chart fails to do well beyond the initial testing on in-sample data. The system shown in the right chart, however, continues to perform well through all phases, including the forward performance testing. A system that shows positive results with good correlation between in-sample, out-of-sample and forward performance testing is ready to be implemented in a live market.

CLOUD AUTOMATION:

Cloud services are easily accessible – they allow the user to access them at any time, from anywhere, and from almost any device.

Can lower costs – cloud computing can lower the costs and provide you with a good connection and hardware that saves you money in the long run.

Easy to maintain – you can upload your trading strategies to the cloud and get them running 24/7 with minimal effort.

Is scalable – you can store almost limitless amounts of data in the cloud.

Easy to set up – setting up your cloud server is quite easy.

III. CONCLUSION

Lately, algo-trading is seen to be gaining immense popularity while contributing to a significant portion of liquidity in the capital markets today. There are two primary objectives behind any algo-trading strategy that are fundamental and arise from our understanding of financial markets namely – to preserve alpha and to create alpha Both these strategies have varying implications across markets that need to be taken into consideration as outlined in paras and. Being a very recent, dynamic and evolving phenomenon, capital markets are compelled – either by design or desire – to continuously monitor, analyze and report on various algo-trading strategies in order to be able to provide a well-functioning market that attracts sufficient liquidity and enables market-making. This paper attempts in outlining some of the implications of algo-trading and strategies to minimize its potentially adverse effects as highlighted in paras and Accommodating algo-trading in an effective manner puts a lot of demand on trading systems as mentioned in paras and

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This is pertinent in the context of certain complex special-purpose order types – illustrated in sections and– that are frequently used in implementing both αP strategies and αC strategies. It is therefore essential for market participants and operators to be provided with a high degree of flexibility and adaptability when designing a market model that is optimal and fit for use in a particular chosen market While I was preparing this project file, various information that I found helped me and I am glad that I was able to complete this project and understand many things. The process of preparation of this project was an immense learning experience and I inculcated many personal qualities during this process like responsibility, punctuality, confidence and others.

I would like to thank to my teachers who supported me all the time, cleared my doubts and guiding me throughout my project. I express my sincere gratitude to Prof Satish Yedge for their continuous support. I am taking this opportunity to acknowledge their support and I wish that they keep supporting me like this in the future.

I would also like to take this opportunity to thank my parents and friends for their support. Above all I am thankful to God

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