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## ALGORITHM TRADING IN INDIA: A BARE ACT

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### ABSTRACT

*Algorithm trading and high frequency trading have caught the fancy of most of the market participants these days. It is the next obvious move in the growth of Indian capital markets which can take it from the category of emerging markets to developed capital markets of the world. And the dream is not far given the recent trends in algorithm trading and HFT turnover at the two leading stock exchanges – NSE and BSE. However, the road has not been so smooth for us. Challenges like lack of regulatory framework, less advanced technological infrastructure, misuse of co-location facility and the whole debate around its inequitable nature have resulted in skeptical environment around the very concept of algo trading and its necessity of future. This paper aims to study the conceptual framework of algorithm trading in the light of literature available from past studies. This shall also be the foundation of future empirical research which is very scant in Indian context. But, such empirical work is highly constrained by availability of data, which is either inaccessible or costly.*

**KEYWORDS:** *Algorithm trading, algo, black box, dark fiber, high frequency trading, Indian Stock markets*

### 1. INTRODUCTION

“Equity market” – the term seems to be a misnomer now a day. There is no equity in the equity markets anymore. There is an increasing trend in the proportion of algorithmic trades in the stock markets. A layman trading at the exchange doesn't even realize that the other trader he is dealing with is actually not human. It is highly sophisticated machine capable of punching millions of order in split seconds. Majority of brokerage houses provide automated trading platforms to their customers. These systems are capable of identifying profitable investment/ trading opportunities and also execute them with a subtle timing. It reduces the need to track price movement in the market to

close a position or modify it according to expected price movement.

It has increased the attractiveness of Indian markets to foreign investors. Moreover, the quantum of trades generated by algo traders is so magnanimous that it can make or break the markets, especially smaller emerging markets. The age old belief of small investors that stock markets are a gamble may get reinforced by algo trading if it is not regulated and monitored. So, the need of the hour is to actually understand the concept of algorithm trading and analyze its present and future in India.

Since there is scant literature available on this topic, the rest of the paper has been divided into following sections: Objectives, Methodology, Algorithm trading and Conclusion.

## 2. OBJECTIVES

The study wants to achieve the following objectives:

- a. To understand the emerging concept of algorithm trading
- b. To do a bare act of the nitty-gritty of algorithm trading systems
- c. To comprehend the status of algorithm trading in India

## 3. METHODOLOGY

This piece of work is completely based on secondary data sources obtained from various sources like SEBI, NSE, BSE, leading national dailies like The Hindu, Business line, The mint, The Economic times, etc and websites like moneycontrol.com, investopedia.com, huffingtonpost.com, etc.

## 4. ALGORITHM TRADING

Even though there is a plethora of algo trading platforms and strategies available in the markets yet it is rare that the retail investors actually understand the mechanism behind them. Therefore, our objective here is to perform a bare act of algorithm trading.

### i) CONCEPT

Algorithmic trading is a form of electronic trading that is carried through computers. A pre-programmed algorithm decides when and how to carry out a certain trade, based on certain conditions specified in the algorithm and checked for against other market data being received from external sources.

According to NSE, “Automated Trading shall mean and include any software or facility by the use of which, upon the fulfillment of certain specified parameters, without the necessity of manual entry of orders, buy/sell orders are automatically generated and pushed into the trading system of the Exchange for the purpose of matching.”<sup>1</sup> There is another variant of algo trading - High Frequency Trading. “It is a

type of algorithmic trading, wherein sophisticated tools and technologies are used for high speed trading. Latencies are measured in microseconds and speed is a competitive advantage.”<sup>2</sup> NSE offers path breaking solutions like AlgoNomics which is a differentiator in the low latency space.

Algo trading occurs at various levels, namely, pre-trade analysis, trade signal generation, trade execution & post-trade analysis. Algo trading seeks to capture anomalies and statistical patterns in markets, execute orders, disguise traders’ intentions and detect / exploit rivals’ strategies. Profits are realized in the form of cost savings, client commissions, proprietary trading.

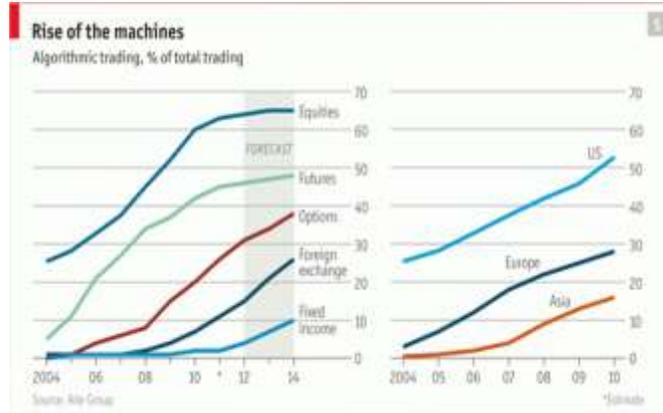
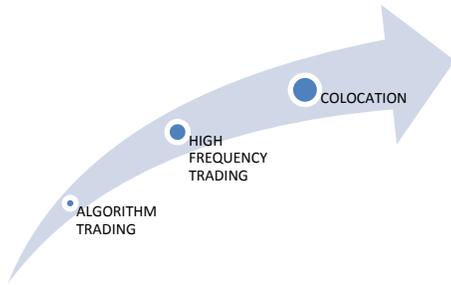
### ii) TRENDS IN AT – INDIA & GLOBAL

Algorithm trading is operating in US markets since 1980s while in India, it was introduced only in 2008 with the launch of Direct Market Access. In 2012, almost 45% of equity derivatives turnover at BSE came from algo trading. It picked up momentum in the entire stock market when ‘co-location’ facility was allowed in India. Co-location refers to an exchange allowing some traders, usually large traders, to place their computer servers next to that of the servers of the exchange for a price.

Current stock market has reached to the stage where the human intervention is completely erased by the algorithmic trading. 70% of trades in US are program driven trades and in Europe it is approximately 40%. In India, one third of the exchange trades are done through algorithmic trading in both the segments.<sup>#</sup> As per news sources, algo trades currently represent 35-40 per cent of the total transactions in the Indian capital markets. However, with this proportion expected to reach 80 per cent by 2020, India would soon catch up with the developed economies.

<sup>1</sup> Source: NSE website

<sup>2</sup> Source: NSE website



**iii) REASONS**

- a. CAPTURE ANOMALIES, STATISTICAL PATTERNS: Some algo trades are formulated to capitalize upon the price differentials of an asset in different markets, these are called arbitrage algorithms. These can also be made for same underlying like NIFTY in different asset classes, viz, equity market and futures market.
  - b. EXECUTE ORDERS: Certain algo strategies are designed to split a large order into smaller orders and send them to exchange throughout a trading session. These multiple smaller orders are inserted into the system at the right time and price so that the prices are not affected much by one particular order in the market. So, algo trading helps in reducing the impact cost of orders.
  - c. Disguise traders’ intentions
  - d. Affect trading factors like transaction cost, profits, etc
  - e. DETECT / EXPLOIT RIVALS’ STRATEGIES: There are several algo programmes prepared to place bluff orders in order to compel other algo traders to reveal their intended orders which then get cancelled by these bluff orders.
- iv) **TYPES** – Algo trading can be classified into two types on the basis of ownership of money invested. (Giuseppe Nuti, et. al. 2011)<sup>3</sup>

- a. **BROKER LEVEL:** in a financial market, intermediaries are responsible for transfer of funds from fund surplus units to fund deficit units. Financial institutions like banks, brokerage houses, etc act as an intermediary to invest money of their clients/customers in markets. It is called as broker level trading.
- b. **PROPRIETARY TRADING:** many financial institutions also invest in stock markets with their own money and hold positions in various securities; this is referred to as proprietary trading.

Type of algorithm trading would influence the strategy design of algo traders.

- i) Broker trading aims at minimization of costs for the clients. Such algorithm trading systems would be designed to reduce Impact cost, Time of execution and Optimize price of transactions.
- ii) Proprietary trading (where firms do Algo Trading) has an objective to maximize profits for the financial institution which is investing its own money. It will be done through index, statistical & merger arbitrage, Volatility arbitrage, Fundamental analysis and Macro trading.

**v) ALGO TRADING STRATEGIES**

Algo strategies can be formulated with various objectives. Some of the most commonly available and used ones are Calendar spread, Cash future arbitrage strategy, Index arbitrage, Pair trading, News based trading strategies and Conversion- reversal. Few of these have

<sup>3</sup> Nuti G., Mirghaemi M., Treleven P. & Yingsaeree C. (2011), “Algorithmic trading” Research feature, IEEE Computer Society, p.p: 61-69.

been explained in later sections of this paper.

#### vi) FORMULATION OF ALGO STRATEGIES

1. Decide genre: The first step is to identify the genre or type of strategy a trader wants to execute. Generally, traders use following types of strategies to make profits: arbitrage, alpha, execution or hedge. For instance, Alpha strategy is designed to capture excess returns from a security whereas Arbitrage makes profits through pair trading based on logical thinking and statistical relations.
2. Establish correlation/co-integration: in the next step, an attempt is made to identify any correlation or co-integration between various securities in same or different asset class in same or different market segments. For example, USD/INR and NIFTY 50 have a negative correlation, so a trader expecting a depreciation of INR vis-à-vis USD he can go for a pair trading involving equity and currency markets.
3. Building model: Based on the relation established in step 2, an algo trading model can be built like an index or mean reversal programme. It is theoretical step where a model is developed on paper.
4. Strategy: Moving further, the trader has to decide in where to quote for the trade, i.e., in NIFTY or USD/INR. Here, it is pertinent to mention that quoting in less liquid one involves risk. If one wants to trade more, quoting in less liquid security will be risky because the order may not get a fill. But there will always be slippage risk.
  - a. Causality test: It is very important to test the significance of any statistical relation identified. Traders use statistical tests to diagnose which variable is causing the other to move.
  - b. Once a lead-lag relation is identified, trader shall quote in the leading variable and cover his position in lagging variable. This helps in keeping slippage risk low.
  - c. Calculating half-life of order book. It is the time in which half the orders are executed.

This will be the quoting level for traders.

5. Testing: once the algo strategy has been designed, the next step is to test it using data.
  - a. Tick level data is used for testing algo trading strategy because it has to be used to do transactions in microseconds. So, for instance, a trader can take 2 months' tick level data for testing. It alone will yield lakhs of data points.
  - b. Testing can be done in any statistical software like MS-Excel, R-excel or MATLAB. Use of R-excel is better than Excel because R-excel can handle more data. If the trader can afford an exclusive licensed software then he can use MATLAB.
6. Implementation: If testing reveals expected results, the algo strategy is ready for use in actual market.

#### 5. EXCHANGE NORMS IN INDIA<sup>4</sup>

“Any program which is designed for algo trading should go under the process of exchange approval. A member can get the approval as approved algorithms through a vendor or as In-house. As per SEBI, a member who intends to start algo trading should have a Base Minimum Capital Requirement of Rs.50 Lakhs. Member can setup the Algo Trading either at their own premises or at co-location services provided by the exchanges. can use Tick By Tick (TBT) broadcast for identifying faster and better opportunities in all the segments of NSE. NSEIT provides a platform to simulate end to end trading environment. It comprises of the Member's front end solution with inbuilt Member's administration and Risk Management features. It can be used to Test your strategies before you trade, Train traders and Investors on Fundamentals of trading or Investment and also to set up Mock Trading Environment.”

Following types of strategies are available:

- a) Pair trading: A pair trading is a stock trading strategy that attempts to capture the spread between two correlated instruments as they return to the mean price. It

<sup>4</sup> Source: NSE Website

encashes upon the price mismatch across segments, exchanges or instruments. It consists of Cash to Cash, Cash to Future, Future to Future and Any Pair trading arbitrage strategies.

- b) Auto-Jobber: Auto-Jobber is a short term high frequency trading strategy. The logic is to trade frequently with smaller profit per trade. The average profit per trade becomes cyclical based on trending and non-trending periods. To take advantage of the trending and non-trending market, Auto-Jobber consists of three approaches: Scalping, Stop & Reverse and Scaling
- c) Delta Hedging: Delta trading strategy is used by option traders to trade the option volatility and hedge the delta risk. On real time basis, strategy tracks the Delta, Gamma, Vega and Theta of the Option Portfolio. Delta trading strategy has a 'Volatility Matrix' for opportunity identification. It is a decision supporting tool for the implied volatility trading.
- d) Option Trader Strategies: Option market watch is a strategy for the option strategies trading. Using option market watch, traders can take advantage of highly fluctuating option price. Users can execute multiple leg option strategies. Users can also define offline order entry price.

SEBI allows algorithmic trading in equities, derivatives and commodities segments. It has issued guidelines on Algo/HFT trading in 2012 and 2013 and in May 2015, it also laid down regulatory requirements to be fulfilled by exchanges offering Co-location facility.

The regulatory requisites comprise of minimum order level checks, a consolidated audit trail, and framework for penalizing cases of high order-to-trade ratios. New algorithms must be tested before they hit the markets.

Recently, there were instances reported where some brokers are supposed to have used preferential access through co-location facility at the National Stock Exchange (NSE). Early login and 'dark fiber' - which provided a split second faster access, to data

feed of an exchange, sufficient enough to make huge gains. Regulators, RBI and SEBI, have commenced a probe into alleged lapses in high frequency trading and the role of some top officials including board member and ex-CEO.

## 6. CONCLUSION

Algorithm trading can be regulated through technology. The exchanges would need technology at par with that used by algo traders. However, Indian policy makers should not make haste in simply imitating the restrictions put by developed markets. SEBI too has very sensibly issued regulations on algo trading in 2012 which clearly portrayed it as the most natural progression of trading in markets. These regulations were not restrictive in nature. But, of late, we have heard about all the mess which has been created out of algorithm trading systems with co-location acting as its accomplice. Dark-fiber or differential access to exchange servers to select few brokers of NSE has come under the radar of market regulator, SEBI.

From academic perspective, this area requires more research and secondly, researchers should be patient before ample algo trading data is available to draw concrete inferences. We need to give markets some more time to accept, trade, experiment, adjust and improve upon the market infrastructure and systems governing algo trading.

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