

## TRENDS, CONCERNS AND PROSPECTS OF ALGORITHMIC TRADING IN INDIAN FINANCIAL MARKETS

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### ABSTRACT

Algorithmic trading or algo trading is the use of computer programs and software to execute trades based on pre – defined criteria and without any human intervention. It is the use of mathematical models to analyze every quote and trade in the stock market, identify liquidity opportunities, and turn the information into intelligent trading decisions. Algorithmic trading, or computer-directed trading, cuts down transaction costs, and allows investment managers to take control of their own trading processes. It is a style or method of trading and not a separate business. High Frequency Trading (HFT) is a subset of Algorithmic trading, and this type of trading involves buying and selling thousands of shares in fractions of seconds. HFT came into spotlight about two years ago when Goldman Sachs sued one of their former employees for stealing code that was used in one of their programs used to execute this type of trade. In 2008, India allowed the first Direct-Market-Access (DMA) and Algorithmic trades to go through. Since then, Algorithmic trading has taken off and now constitutes a sizeable percentage of all trading activity on the National Stock Exchange (NSE) and the BSE. This paper tries to analyse the Trends, Concerns and Prospects of Algorithmic Trading in Indian Financial Markets.

**Keywords:** Algorithmic trading, Concerns and Prospects, Direct-Market-Access, National Stock Exchange, Bombay Stock Exchange

## I. INTRODUCTION

Trading in financial markets require precision in analysis of data and timely trade execution. Today's hyper-competitive trading environment and volatile financial markets give very less scope for chance and hence, taking the aid of computer programmes in various aspects of trading is almost a necessity. Computer programmes can identify and react more rapidly to temporary mispricing of securities and can examine prices from several markets simultaneously resulting in better timing of trade and thereby profit. This computer aided trading known as Algorithmic trading, (also called automated trading, black-box trading, or algo trading) gained recognition in the Indian marketplace in 2008, when India allowed the first Direct-Market-Access (DMA) and Algorithmic trades to go through. Presently one third of all the trades taking place in Indian market are Algorithmic based.

## II. DEFINITION

SEBI defines "any order that is generated using automated execution logic shall be known as Algorithmic trading". It is the use of electronic platforms for entering trading orders with an Algorithmic which executes pre-programmed trading instructions whose variables may include timing, price, or quantity of the order, or in many cases initiating the order by automated computer programs. Algorithmic trading is widely used by investment banks, pension funds, mutual funds, and other buy-side (investor-driven) institutional traders, to divide large trades into several smaller trades to manage market impact and risk. Algorithmics are mathematical models that analyse the market by looking into every trade that takes place and every order that is placed to identify liquidity opportunities and turn the information so collected in taking trading decisions and execute them intelligently, at the optimal time, based on the goals specified by the parameters and the constraints given by the Algorithmic.

## III. POPULAR ALGORITHMS

Most commonly used Algorithms in the market are: arrival price, time weighted average price (TWAP), volume weighted average price (VWAP), market-on-close (MOC), and implementation shortfall (the difference between the share-weighted average execution price and the mid-quote at the point of first entry for market or discretionary orders). Arrival price is the midpoint of the bid-offer spread at order-receipt time, and it also notes the speed of the execution. VWAP is calculated by adding the rupees traded for every transaction in terms of price and multiplying that by shares traded, and then dividing that by the total shares traded for the day. MOC measures the last price obtained by a trader at the end of the day against the last price reported by the exchange. Implementation shortfall is a model that weighs the urgency of executing a trade against the risk of moving the stock. (Rao., S. K. 2006-07)

## IV. ADVANTAGES OF USING ALGORITHMIC TRADING

1. Trading opportunities, in many cases, are short lived and speed of execution of orders is very important. Algorithmic Trading help in capturing these short lived trading opportunities.
2. Algorithmic Trading automates trading with minimum human intervention.
3. Algorithmic Trading is a rule based trading system without any scope for human emotions to adversely affect the trade.

4. Algorithmic Trading reduces trading risks by eliminating the possibility of human error in judgement, overtrading, etc.
5. Time taken to take trading decision and execution is very important in the market especially when it is volatile. This process can be done quickly with the help of Algorithmic Trading
6. Complex trading strategies, which are difficult to execute, can be executed using Algorithmic Trading model.

## V. COMMONLY USED TRADING STRATEGIES IN ALGORITHMIC TRADING

Many strategies are developed by market participants to take the maximum benefits. The in-house strategies are, generally, closely guarded but a few commonly used strategies can be listed as below;

1. Alfa Signal based single leg strategies (Technical Trading)
2. Pair Trading (Co-variance/Co-Integration based)
3. Delta Neutral Strategy
4. Locks (Conversion, Reversal, Long Box, Short Box, Jelly Roll)
5. Index Arbitrage
6. High Frequency Trading
7. Market Making (Ask/Bid spread trading)
8. Implied Volatility (IV) based trading
9. Gamma Scalping

## VI. RECENT TRENDS IN ALGORITHMIC TRADING IN INDIA:

The volumes generated by Algorithmic Trading contribute to nearly 25.2 per cent of the total volumes in the Indian Financial Market as of April 2014. There is an overall upward trend in the percentage of Algorithmic Trading volume out of the total volume traded in BSE and NSE during the period from December 2013 to April 2014. The upward trend is driven by the change in investor sentiments on Indian Economy at large to a great extent. The year 2014 has also seen the entry of non-traditional players – hedge funds and large institutions are the traditional players – in Algorithmic Trading. Algorithmic Trading is generally avoided by individuals without proprietary trading desks. Educated individuals with background knowledge of Algorithms are now participating in the Algorithmic Trading in India. These individuals are bringing in the expertise of the developed markets like US and Europe to Indian market. This will encourage more participation and improvement in the overall market conditions and use of technology in India. Table 1 shows the month-wise average daily turnover and percentage of Algorithmic trading volumes out of the total volumes.

## VII. ALGORITHMICS: AREAS OF CONCERN

**Lack of Visibility:** We know what a specific Algorithmic is supposed to do, measure its pre-trade analytics and see how the post-trade results match up to that expectation. But if the trader didn't select the most optimal Algorithmic for that trade little can be done. This problem is caused by a lack of visibility and transparency into the Algorithmic while it is executing orders.

**Algorithms Acting on Other Algorithms:** If fund managers' trading pattern is spotted and regular; tracked with the use of Algorithms, then these Algorithms are liable to be 'reverse

engineered'. This implies that their buy and sell orders are pre-empted and used to the maximum effect by their competitors. Here, Algorithms are acting on other Algorithms.

**Table 1: Month-Wise Average Daily Turnover and Percentage of Algorithmic Trading Volumes Out of the Total Volumes**

Month	Month-Wise Average Daily Turnover	Percentage of Algorithmic Trading Volumes out of the Total Volumes
Dec-13	172843	18.23
Jan-14	207641	19.89
Feb-14	188343	17.73
Mar-14	227233	19.22
Apr-14	187400	25.18

Source: Business Standard June 10, 2014

**Which Algorithmic to Use?:** With brokers offering many Algorithmic strategies, one concern is that buy-side institutions lack the tools to understand which Algorithmic to use for a particular stock. The lack of a standard benchmark has made it almost impossible to assess the quality of Algorithms. Buy-side firms are having a hard time evaluating when to use a particular Algorithmic. For example, if a portfolio manager tells a trader to sell a mid-cap, semi-illiquid stock within five hours—because the manager has to raise cash—the trader may be confused about which Algorithmic would be the best solution, given the constraints on liquidity and time. They need a certain level of sophistication and understanding to use it.

Algorithmic trading requires careful real-time performance monitoring as well as pre and post-trade analysis to ensure it is properly applied. Traders must calibrate the Algorithms to suit portfolio strategy. Far from the sole or final answer to best execution, Algorithmic trading represents an additional tool in a trader's expanding kit. Far more important is aligning execution choices with the level of order difficulty involved in terms of: order size, liquidity, and trade urgency. Low touch venues such as Algorithmic trading lend themselves best to easier types of orders such as low-urgency and small orders for large cap stocks. But urgent orders for a large volume of small cap stocks would require a higher-touch approach to ensure best execution and cost efficiency.

**Missing Ingredient—the Trader's Gut Feel:** Algorithms are simply advanced trading tools and they cannot replace the human elements or make interaction redundant. Algorithms fail to capture a trader's "gut feel". It is the intraday trading characteristics of a stock that assist a trader in determining the right strategy, whether to back off or be more aggressive. In order to allow their guts to play a proper role, the traders need to see precisely what actions their Algorithms are taking, what venue the orders are being sent to, and where they get filled. It is early in the development of trading software to think that the thought process of a human trader can be mimicked by an Algorithmic. Algorithms cannot compete with the ability of the human brain to react to unanticipated changes and opportunities. Some Algorithmic providers are trying to addressing this

issue by offering instant messaging (IM) services that work with the Algorithmic. As trades go on, a trader is alerted of issues that arise and the trader can alter the strategy depending on the nature of news.

At the end of the day, it's the clients who drive the demand and innovation necessitating next generation Algorithms. The next generation of Algorithms will be able to "speak" to the trader, to let the trader know what is going on dynamically, and allow the trader to interact with the Algorithmic. Soon we will have adaptive Algorithms that adjust their execution at each moment in time in response to what they see happening in the market just as a human trader.

## VIII. FUTURE PROSPECTS

Algorithms have and will continue to spark fundamental changes in the way securities market functions. It is not possible at present to outline the effects of Algorithmic trading and how it will change itself and the future of the market. But it will result in firms re-evaluating and evolving their views, trading strategy, asset-class mix, the relationship between buy-side and sell-side, the composition and skills of the people they employ and information technology.

**Algorithms for Currency Trading:** Algorithms will have a place in the \$2 trillion-plus global foreign exchange market. Fast-moving FX markets will have greater opportunities for Algorithmic trading more effectively than in the equity market and established equity trading techniques can be easily applied for currencies.

**Cross-Asset Trading:** A trader can, say, buy equity, hedge with a derivative of the equity, and take out a foreign exchange position as part of a single strategy to generate excess returns. This will then be called as Cross-Asset trading. We will see Algorithms enabling traders to monitor and respond to multiple liquidity pools across various asset classes to capitalise on high frequency cross-asset opportunities.

**Algorithms for News Analysis:** If an Algorithmic can analyse news, it will do so much faster than the human trader and give input to the traders on the effects of the news on the market. This will enable traders to take positions based on the news much faster.

**Regulatory Compliance:** Regulations become more stringent with the evolution of the technology to take care of the investors and the market at large. Market participants will adopt the latest in Algorithmic trading technology that can address the regulatory issues and the regulators will automate the surveillance to make sure that the participants are not abusing the technology.

**Risk Management:** Traders need to manage their risk and will encourage developing sophisticated Algorithms that can respond to risk conditions on a real-time basis so that the positions can be hedged automatically.

## IX. CONCLUSION

The exchanges – BSE and NSE – and the regulators have been investing heavily on the technology and to put in place relevant regulations like risk and collateral controls, monitoring measures etc. to prevent problems. Co-location facilities are available, at present, from both the main equity exchanges along with smart order routing between these exchanges. Hence, the Indian market has prepared itself to handle the need of the hour and further developments will have to take place with the advancements in the technology and Algorithms. The technology now required to run Algorithmic trades is highly sophisticated and only a few houses are able to afford it which leaves out smaller players. This can adversely affect the small players. Technology that is not available

universally is as good as absent; hence, efforts need to be put to make the benefits available to smaller players.

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