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Algorithmic Trading: What it is, How to Start, Strategies, and More

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Industry | 📅 Sep 04, 2024 | 🕐 13 min read

By Chainika Thakar

Algorithmic trading (or simply algo-trading) is a method of trading where we use computer programs to follow a defined set of instructions or rules to calculate the price, quantity, timing and other characteristics of the orders. [1]

So, if you are curious about how technology is revolutionising the financial world and boosting ...es, stick around—algorithmic trading might just

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Also, algorithmic trading market size was valued at USD 15.76 Bn. in 2023 and the total algorithmic trading revenue is expected to grow by 10.6 % annually from 2024 to 2030, reaching nearly USD 31.90 Bn. [2]

Let us learn more about algorithmic trading with this blog that covers:

- Brief of Algorithmic Trading
- The Transformation from Manual to Algo Trading
- When did Algorithmic Trading start?
- Frequencies of Trading: HFT, MFT, LFT
- Algo Trading Strategies
- How to Learn Algorithmic Trading?
- The workflow of Algorithmic Trading
- How to build your own Algorithmic Trading Business or Desk?
- Advantages of algorithmic trading
- Disadvantages of algorithmic trading
- Recent developments and potential future trends in algorithmic trading

Brief of Algorithmic Trading

In algorithmic trading, the trading signals (buy/sell decisions) are generated based on a set of instructions. [1]

Let's dive deeper into the evolution of trading, from its manual beginnings to the sophisticated algorithm-based systems we have today.

To get started, below is part 2 of our video series, "Algo Trading Course." This segment covers the basics of algorithmic trading, the industry landscape, pros and cons, how to build an algo trading strategy with Python, the benefits of a quant trading approach, and much more!

Full Algo Trading Course | Learn Algorit…

Further, let us find out the transformation of trading from a manual to an algorithmic approach.

The Transformation from Manual to Algo Trading

So, what was trading like in the bygone era when automation did not exist?

Recommended reads:

The Evolution Of Trading: Barter System To Algo Trading

Why you should be doing algorithmic trading?

Trading in the bygone era and Trading Now!

Conventional trading was what existed before algorithmic trading came into being. Looking back, conventional trading dates back to around 1602 with the Dutch East India Company, which marked the beginning of organised trading practices. Back in time, when the concept of automated trading was not introduced, traders would execute the trades manually without having any other option.

For those exploring the shift from traditional methods to modern automated trading, a Guide to learn algo trading serves as a crucial resource. It offers insights into the fundamentals of algorithmic trading, from basic principles to developing and deploying automated strategies, making the transition into this evolving landscape more accessible.

Over a period of time, the need for a faster, more reliable (free of human emotions), and accurate method led to the beginning of algorithmic trading.

And now, let us move further into understanding what has happened post-arrival of Algorithmic trading.

Is algo trading affecting the traditional traders?

Speaking about algorithmic trading outperforming traditional trading, it is obvious that trading via algorithms is much faster with no human errors. Besides, algorithmic trading is considered to be no threat to traditional traders. This is because human intervention will always be needed for better market-making and to ensure stability in financial markets. [2]

Since now you know what trading was like before automation took over, next you will get to know when exactly manual trading started, and when algorithmic trading came into the picture.

When did Algorithmic Trading start?

It wasn't until the late 1980s and 1990s that algorithmic trading, involving fully electronic trade execution, made its debut in financial markets.

By 1998, the U.S. Securities and Exchange Commission (SEC) had approved electronic exchanges, paving the way for computerised High-Frequency Trading (HFT). Since HFT can execute trades up to 1,000 times faster than humans, it quickly became widespread.

Now we will discuss the various types of trading frequencies which are adopted by the traders.

Frequencies of Trading: HFT, MFT, LFT

Now, there is a particular level of speed at which trading (buying and selling of stocks) takes place.

Below, let us go through the three types of trading, each based on its frequency or speed.

1. High-Frequency Trading (HFT): This type of trading leads to high-speed trade, i.e., large numbers of orders are executed within seconds. Hence, it makes the trading of securities possible in the market every millisecond, making it highly profitable. This type of trading is a low-latency trading practice which means that the trading happens much faster than the competition in response to market events.

2. Medium-Frequency Trading (MFT): Takes a few minutes to a day to place the trade, and hence, is slower than high-frequency trading. Its latency (time taken to place the trade) is higher than HFT.

3. Low-Frequency Trading (LFT): Takes place in a day to a couple of weeks and is the slowest type of trading. Hence, the latency time (time taken to place the trade) is much higher than HFT and MFT.

Hold on! We haven't reached the end yet. Since algorithmic trading requires strategies for making the most profitable decisions, there are various strategies, each based on different market conditions.

Let us check out the algorithmic trading strategies

now.

Algo Trading Strategies

Here's a list of the most popular strategies and their explanations:

- [Market Making Strategies](#)
- [Statistical arbitrage Strategies](#)
- [Momentum Strategies](#)
- [Mean reversion strategies](#)
- [Sentiment Based Trading Strategies](#)
- [Machine Learning Trading Strategies](#)

Market Making Strategies

This strategy helps to increase the liquidity in the markets. A [market maker](#), usually a large institution, facilitates a large volume of trade orders for buying and selling. The reason behind the market makers being large institutions is that there are a huge amount of securities involved in the same. Hence, it may not be feasible for an individual intermediary to facilitate the kind of volume required.

In this process, the market makers buy and sell the securities of a particular set of firms. Every market maker functions by displaying buy and sell quotations for a specific number of securities. As soon as an order is received from a buyer, the market maker sells the shares from its own inventory and completes the order. Hence, it ensures liquidity in the financial markets which makes it simpler for investors as well as traders to buy and sell. This sums up that market makers are extremely important for sufficing trade.

Statistical Arbitrage Strategies

Statistical arbitrage strategies are based on the mean reversion hypothesis. Such strategies expect to gain from the statistical mispricing of one or more than one asset on the basis of the expected value of assets.

One of the examples of Statistical Arbitrage is pair trading where we look at a ratio or spread between the pair of stocks' prices, which are cointegrated. If the value of the spread goes beyond the expected range, then you buy the stock which has gone down and sell the stock which has outperformed in the

expectation that the spread will go back to its normal level. Statistical arbitrage can work with a hundred or more stocks in its portfolio which are classified according to a number of factors and can be fully automated from both analysis & execution perspectives.

Momentum Strategies

The momentum trading strategies profit from the market swings by looking at the existing trends in the market. So it seeks to buy high and sell higher to make the investment in the stocks profitable.

Momentum works because of the large number of emotional decisions that other traders make in the market during the time when prices are away from the mean. Hence, the gain takes place due to others' behavioural biases.

The only tricky part here is that trends may swiftly reverse and disrupt the momentum gains, which makes these strategies highly volatile. So it is extremely imperative to schedule the buys and sells correctly and avoid losses. This can be done with appropriate risk management techniques that can properly monitor the investment and take actions to

safeguard in case of adverse price movement.

Mean reversion strategies

Financial markets are a dynamic ecosystem, constantly shifting and adapting. Amidst this volatility, the mean reversion principle emerges as a strategic beacon. At its core, mean reversion trading hinges on a simple yet profound notion: what goes up must come down, and what falls too far is likely to bounce back. This foundation is built upon the idea that asset prices, amidst short-term fluctuations, possess an inherent tendency to gravitate back towards their historical averages over time. Note that when you look at one asset, this mean reversion principle could be a short term phenomenon.

Recommended read:

[Quantitative Value Investing Strategy in Python](https://blog.quantinsti.com/algorithmic-trading/)

Value investors often use this approach to buy stocks for long-term investments. Similarly, mean reversion principles can be used with technical indicators to develop short-term trading strategies based on the expectation that prices will revert to

their mean.

Sentiment-Based Trading Strategies

Sentiment-Based Trading Strategies involve making trading decisions based on the analysis of market sentiment, that is, the collective mood or attitude of investors towards a particular asset or market. The sentiment of the market is usually ascertained by social media, news articles, financial reports, etc. These sources help to find out whether the sentiment is bullish, bearish, or neutral, on the basis of which the trades are executed accordingly.

Recommended read:

Sentiment analysis for trading

Machine Learning Trading Strategies

Machine learning, as the name suggests is the ability of a machine to learn, even without programming it explicitly. It is a type of Artificial Intelligence or AI which is based on algorithms to

detect patterns in data and adjust the program actions accordingly.

AI in trading stocks utilizes these machine learning algorithms to improve trading efficiency and accuracy. By analyzing historical and real-time data, AI systems can help identify profitable opportunities and execute trades with precision, adapting to market changes faster than traditional methods.

Example:

Facebook's News feed personalises each of its members' feeds using machine learning. The software uses statistical and predictive analytics to identify patterns in the user's data and uses it to populate the user's Newsfeed. If a user reads and comments on a particular friend's posts then the news feed will be designed in a way that more activities of that particular friend will be visible to the user in his feed. The advertisements are also shown in the feed according to the data based on user's interests, likes, and comments on Facebook pages.

So it means that human intervention is always required. The benefit here is that Machine Learning

based models analyse huge amounts of data at a high speed and indulge in improvements themselves. This is much simpler than a conventional basic computer model built by data scientists or quants.

This was all about different strategies on the basis of which algorithms can be built for trading.

Recommended reads:

Algorithmic trading strategies and paradigms

How much salary does a quant earn?

Looking to create your own trading strategy?

Below in the video is part 2 of the video series, "Algo Trading Course", which covers a wide range of topics including trading idea generation, alpha seeking, universe selection, entry and exit rules, coding logic blocks, and backtesting.

Full Algo Trading Course | Algo Trading …

Below are some **recommended reads** to look into the rules and regulations in India, the U.S. and the EU.

Algorithmic Trading in India: Resources, Regulations, and Future

Algorithmic Trading Regulations - US

Algorithmic Trading Regulations - EU

Going forward, let us see how to can you learn the algo trading.

How to Learn Algorithmic Trading?

To learn algorithmic trading, you can follow these key steps:

1. Build the skills and knowledge needed for algorithmic trading such as:

- **Quantitative Analysis skills**: Develop skills in statistics, time-series analysis, and using tools like Python, Matlab and R. Focus on problem-solving and data analysis.
- **Financial Markets Knowledge**: Gain an understanding of trading instruments, strategies, arbitrage opportunities, and risk management.
- **Programming Skills**: Learn programming languages essential for algorithmic trading, with Python being particularly important. Practice coding and understand how to implement trading strategies.

Algo trading for beginners should start with mastering these foundational areas before moving on to more advanced topics. Beginners are encouraged to experiment with simple trading algorithms and gradually increase complexity as their confidence and understanding grow. Starting with structured courses and practical projects can make the learning journey smoother and more engaging.

2. Choose Learning Resources:

Books: You can begin with the free books such as:

1. "Algorithmic Trading: A Rough & Ready Guide" by Vivek Krishnamoorthy and Ashutosh Dave
2. "Machine Learning in Trading: Step by step implementation of Machine Learning models" by Ishan Shah and Rekhit Pachanekar
3. "Neural Networks & Deep Learning" by Michael A. Nielsen
4. "Python Basics: With Illustrations From The Financial Markets" by Vivek Krishnamoorthy, Jay Parmar and Mario Pisa Peña

Recommended read:

Free Resources to Learn Algorithmic Trading | A
Compiled List

- **Other Free Resources**: Utilise YouTube videos,
  and podcasts to supplement your learning.
- **Online Courses and Certifications**: Enroll in
  algorithmic trading course like the Executive
  Programme in Algorithmic Trading (EPAT)
  offered by QuantInsti. Explore other platforms
  like Coursera and Udacity for specialised
  courses.

For a more in-depth understanding, consider taking
algorithmic trading courses that offer
comprehensive training and hands-on experience in
the field.

3. Hands-On Experience:

- **Backtesting**: Test your strategies using
  historical data to evaluate their potential
  effectiveness.
- **Paper Trading**: Use virtual money to refine your
  strategies and understand market dynamics.
- **Practical Implementation**: Once comfortable,
  apply your strategies in live trading
  environments. Seek internships or work with

firms to gain real-world experience.

4. Advanced Learning and **Continuous Improvement**: Stay updated with industry trends and continuously refine your skills while getting started with algorithmic trading. Join professional networks and communities to learn from experienced practitioners.

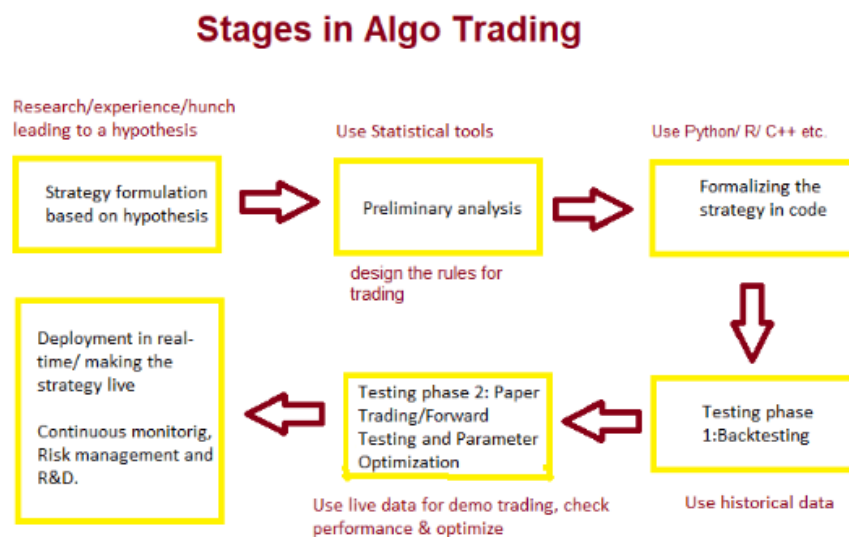Let us now see the workflow of algorithmic trading next.

The workflow of Algorithmic Trading

Coming to the "Understanding of the Workflow", it is a concept that explains how each trade gets placed using algorithms behind the scenes.

Historically, manual trading used to be prevalent, in which, the trader was required to gather the data manually and place the order telephonically for the execution of the trade. That would involve a lot of time and effort and hence, not make much of returns since not much of trading could take place.

Now with Algorithmic trading coming into existence, the entire process of gathering market data till placement of the order for execution of trade has become automated.

Coming to how a quantitative analyst goes about implementing algorithmic trade, here is a simplified diagram:

Stages in Algo Trading

Research/experience/hunch leading to a hypothesis → Strategy formulation based on hypothesis → (Use Statistical tools) Preliminary analysis, design the rules for trading → (Use Python/ R/ C++ etc.) Formalizing the strategy in code → Testing phase 1:Backtesting (Use historical data) → Testing phase 2: Paper Trading/Forward Testing and Parameter Optimization (Use live data for demo trading, check performance & optimize) → Deployment in real-time/ making the strategy live. Continuous monitorig, Risk management and R&D.

The image above shows how a quant implements algorithmic trade.

In the first step, you will need to do research or get some experience leading to a hypothesis. That is how your strategy formulation will be based on the hypothesis you set.

Then in the second step, with the help of preliminary analysis and usage of statistical tools, the rules are designed for trading.

In the third step, the strategy is formalised in coded language using one of the languages namely, Python/R/C++. This is done for the system/computerised trading platform to understand the strategy in a language that is understandable to it.

Now, in the fourth step, Testing phase 1 is done through backtesting, in which historical price information is taken into consideration. In this, the strategy is tested using historical data to understand how well the logic would have worked if you used this in the past. This way, the performance of the strategy is tested. Also, depending on the results you get the opportunity to optimise the strategy and its parameters.

Then, the fifth step is Testing phase 2 in which the testing of strategy happens in the real environment. In this, you do not need to invest actual money but it still provides you with a very accurate and precise result. Hence, with this, one can expect to get the

results which may also come about in the actual environment. The only drawback is that it is a time-consuming activity but you can do this by using the feature provided by the broker. Alternatively, you can also develop your framework to test the game.

The sixth step involves deployment in the real environment, which requires multiple facets to be managed, which are generally not considered in backtesting.

Functionally, the following aspects are required to be managed:

- Order management
- Risk Management
- Money/Fund Management
- Diversification of assets
- Portfolio management
- User Management
- Slippages

Technically, the following aspects are required to be managed:

- Establish a Connection with the broker API.
- Passing the buy/sell orders using the broker

connection

- Establish a Connection with the data API (if the data vendor is different from the broker)
- Accessing the real-time and historical data using a data API connection

In this 3rd and final part of the video series, "Algo Trading Course" explore how Python trading bots can be used to backtest a trading strategy on a research platform such as Blueshift.

Full Algo Trading Course | Python Tradin...

Next, let us check out how to build your algorithmic trading desk.

How to build your own Algorithmic Trading Business or Desk?

For setting up your algorithmic trading desk, you will need a few things in place and here is a list of the same.

Operational considerations

- **Registering company** - Choose the appropriate legal structure and register with relevant authorities to obtain licenses and permits.
- **Capital requirements** - Determine the initial funding needed to cover trading activities, infrastructure, and operational costs.
- **Trading paradigm** - Decide between high-frequency trading, algorithmic trading, or other strategies based on your objectives and market conditions.
- **Access to market** - Establish connections with exchanges and brokers to facilitate trading and

data acquisition.

- **Infrastructure requirements** - Set up reliable hardware and software systems, including servers, networking equipment, and databases.
- **Algorithmic trading platform -** Select or develop a platform capable of executing algorithms, managing orders, and integrating with market data feeds.
- **Backtesting -** Use historical data to test and refine trading algorithms before deploying them in live markets.

Additional tools

- **Risk management software -** Implement tools to monitor and control exposure, manage risk limits, and ensure compliance with risk policies.
- **Order management systems (OMS) -** Utilise OMS to manage and execute orders, track trading activity, and integrate with trading algorithms.

Team structure and roles

- **Quantitative analysts and developers -** Develop and implement trading algorithms and models using advanced mathematical and

programming skills.

- **Risk analysts and managers -** Monitor risk exposure, analyse potential threats, and develop strategies to mitigate financial and operational risks.

- **IT support and infrastructure specialists -** Manage and maintain technology systems, ensuring reliability, performance, and security of trading infrastructure.

Now we will see some advantages of algorithmic trading.

Advantages of algorithmic trading

Here are some of the advantages of algorithmic trading.

- **Speed and Efficiency:** Algorithms can process data faster than humans and generate trading signals before human traders can react.

- **24/7 Trading:** Can operate around the clock, including during off-hours in the current location when market is open across different time

zones.

- **Consistency:** Follows predefined strategies without emotional influence, leading to more consistent trading decisions.
- **Backtesting:** Allows thorough testing of strategies against historical data to refine and improve performance before live deployment.

Recommended read:

[How much salary does a quant earn?](#)

Let us move to the disadvantages of algorithmic trading now.

Disadvantages of algorithmic trading

Below you can see the disadvantages of algorithmic trading.

- **Market Impact:** Algorithmic trading algorithms can contribute to market volatility and exacerbate market crashes.
- **Regulatory Risks:** Subject to evolving

regulations, which can create compliance challenges and potential legal risks.

- **Over-Reliance on Models:** May lead to poor performance if algorithms are based on flawed models or assumptions, particularly in unpredictable market conditions.

Recommended read:

Algorithmic trading risk

Now we will see the recent developments and potential future trends surrounding algorithmic trading.

Recent developments and potential future trends in algorithmic trading

In India, around 50-55% of trades are currently executed through algo trading, and this figure is expected to grow by 15% in the coming years.

Robo-advisory services utilise algorithms to deliver financial advice and handle portfolio management

with little to no human input, making financial planning more affordable and efficient for a wider range of clients. The global robo-advisory market is projected to grow to $41.07 billion by 2027. [5]

The influence of AI algorithmic trading on the stock market is expected to increase. Software developers are likely to create more advanced and faster algorithms capable of analysing larger datasets. These systems will improve at detecting intricate patterns, swiftly adapting to market changes, and adjusting trading strategies in real-time. This trend may lead to AI trading becoming a dominant force in financial markets, potentially consolidating power among a few firms with the most advanced technology. [6]

Conclusion

The algorithmic trading business is sure to offer you an advanced system of trading. With the apt knowledge, regular compliances and regulations, an algorithmic trading platform is the fastest choice amongst traders.

In case you are also interested in developing lifelong skills that will always assist you in improving your trading strategies. In this automated trading course, you will be trained in statistics & econometrics, programming, machine learning, and quantitative trading strategies and methods, so you are proficient in every skill necessary to excel in quantitative & algorithmic trading. Learn more about the EPAT course now!

Note: The original post has been revamped on 4th September 2024 for recentness, and accuracy.

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Chainika bridges the gap between complex
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