



Algo trading basics

Day 1: The big picture

Vivek Krishnamoorthy

20th May 2021

DISCLAIMER



All investments and trading in the stock market involve risk. Any decisions to place trades in the financial markets, including trading in stock or options or other financial instruments is a personal decision that should only be made after thorough research, including a personal risk and financial assessment and the engagement of professional assistance to the extent you believe necessary. The trading strategies or related information mentioned in this presentation is for informational purposes only.

Today's agenda



- About us
- About the speaker
- The climax
- The plan for today, tomorrow and the day after
- What is algorithmic/quantitative trading?
- Current trading and investing landscape
- Pros and cons of quant trading
- Steps to build a quant trading strategy
- Traditional vs quant approach
- Redux: Benefits of the quant approach
- Types of data inputs
- What can I do to get familiar with the quant trading domain?
- Final word
- Continue the learning
- What's in store for tomorrow?

About us



Vivek Krishnamoorthy

- Head – Research & Content, QuantInsti
- Over 14 years of experience in industry and academia in leading institutions across India, Singapore and Canada
- Co-author of
 - *“Python basics: With illustrations from the financial markets”* (2019)
 - *“A rough-and-ready guide to algorithmic trading”* (2020)
- Bachelors’ in electronics & telecom engineering from VESIT (Mumbai University), and an MBA from NTU Singapore.

First, the climax

- By the end of this 3-day workshop, you will
 - Learn to backtest a quant trading strategy on historical data and multiple assets (with little or no programming)
 - Analyze its performance
 - Learn how to take it live (based on past performance)

The three-day plan

The three-day plan



- Day 1: The big picture
 - You'll get a feel for the quant finance domain, the difference in quant and manual trading approaches, and how strategies are developed
- Day 2: The finer details
 - You'll learn about strategy workflows, sources to fetch data, and to formulate and backtest a strategy in Python
- Day 3: Test driving a strategy
 - You'll extend on some of the backtesting ideas you learned in the previous session by working in a research and live trading environment.

What is algorithmic/quant trading?

Quant/algorithmic trading: Definition(s)

Different regulators, different definitions!

SEBI

Algorithmic Trading – Any order that is generated using automated execution logic shall be known as algorithmic trading.

Trading in financial instruments which meets the following conditions:

(a) where a computer algorithm automatically determines individual parameters of orders such as whether to initiate the order, the timing, price or quantity of the order or how to manage the order after its submission

(b) there is limited or no human intervention

does not include any system that is only used for the purpose of routing orders to one or more trading venues or the processing of orders involving no determination of any trading parameters or for the confirmation of orders or the post-trade processing of executed transactions.

MIFID II

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Algorithmic Trading, Algo-Trading or Automated Trading: High-frequency trading belongs to a larger category of trading known as algorithmic, electronic, or automated trading. In algorithmic trading, firms use computers programmed with specific algorithms — sequences of steps — to identify trading opportunities and execute orders. High-frequency traders combine algorithmic trading with high-speed data connections to make their lightning-fast order submissions (and cancellations or modifications).

Algorithmic trading: Simple definition



- Use of computer programs to trade financial assets in a premeditated manner
- Set rules to calculate the price, timing and other characteristics of the orders
- Orders can be placed in a semi or fully automatic way (more likely!)

Algorithmic trading: A catch-all term

- Colloquially, we use this term to refer to trading approaches which are any of the following

Automated (using programs to set trading rules and let them run in live markets)

Systematic (defining trading goals, risk measures, capital allocated, etc. and make trading decisions based on them)

Quantitative (using statistical modeling to arrive at trading rules and follow them in live markets)

- or, even a combination of one or more of the above

Current trading & investing landscape

Current trading & investing landscape

Markets are increasingly being dominated by algorithms

Industry has moved towards automation & use of data-driven approaches to trading and investing

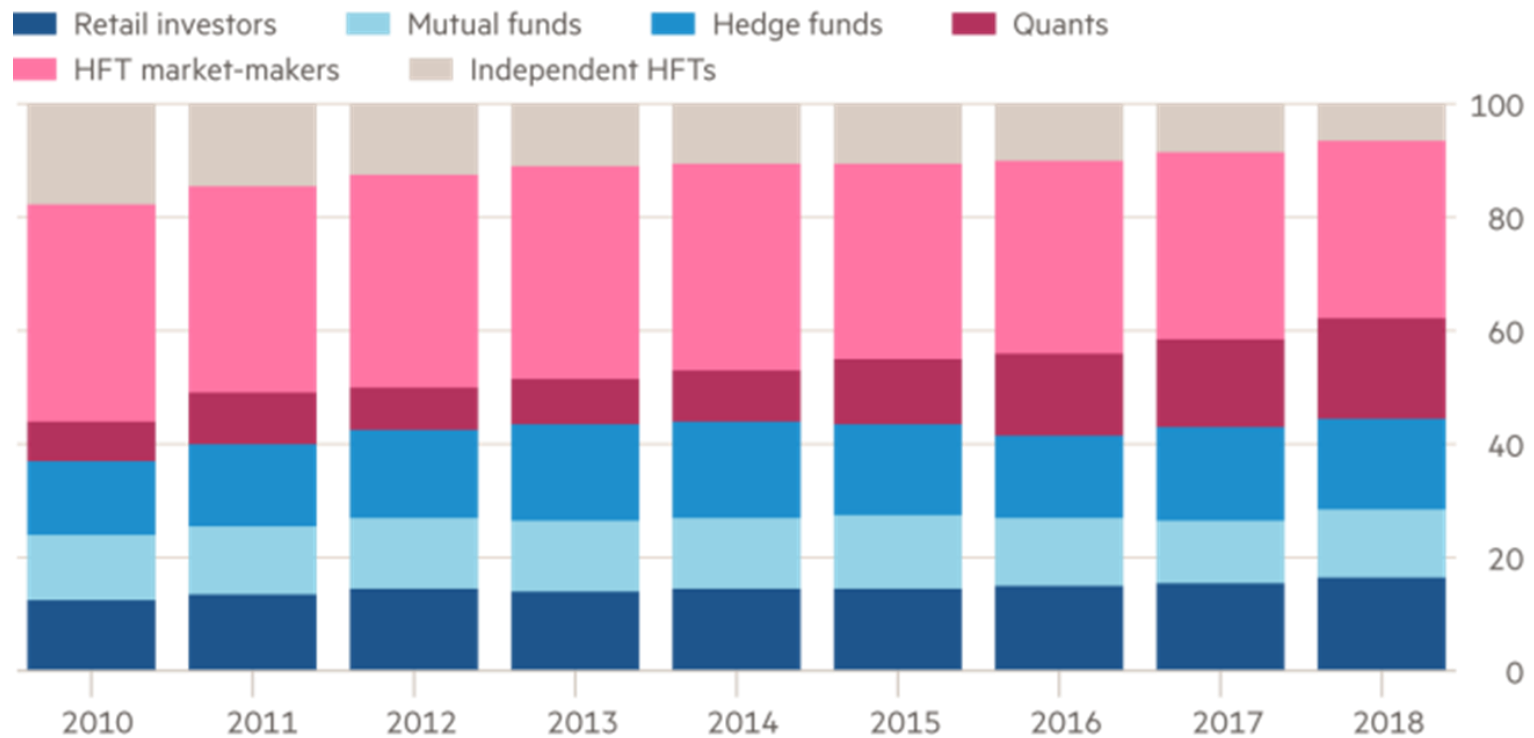
So important to understand the methods used by major market players

Many retail traders also adopting these methods

Current trading & investing landscape

Quants and high-frequency traders account for over half of all US equity trading

Market share (%)



Source: Tabb Group

© FT

Current trading & investing landscape


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Future Finance
Traders Who Can't Code May Become Extinct, Goldman's Tech Pioneer Warns
By Sonali Basak
20 September 2019, 16:38 GMT+5:30


- ▶ Senior Goldman executive reflects on industry as he steps down
- ▶ Distinction between trading, engineering to disappear, he says

Marty Chavez: Extinction Looms for Traders Who Can't Code



mint

Home > Markets > Stock Markets > Algos are changing India's stock markets



Tracker

Technology is an opportunity, and in finance, it provides a direct link to profit as well. You can use it for good. But you can clearly use it for evil as well (Photo: Jayachandran/Mint)

Algos are changing India's stock markets
10 min read · Updated: 13 Jan 2020, 10:52 AM IST
Deepak Shetty

- Complex algorithms will soon be behind more daily stock trades than humans. What if the math goes wrong?
- Complex algos will, at some point, take over the Indian stock market. Is it fair for a few well-heeled market participants to secure undue advantages with the help of technology?

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Business
Citigroup Forms Lab for Traders to Code and Coders to Trade
By Jennifer Surane
May 3, 2019, 5:30 PM GMT+5:30 Updated on May 3, 2019, 6:48 PM GMT+5:30

- ▶ Markets Acceleration Lab is seeking about 12 people at first
- ▶ Goal is 'to attract and create a pipeline of unique talent'

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Citigroup Inc. isn't just teaching traders how to code, it's also making sure its coders know how to trade.

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Markets
A Goldman Trading Desk That Once Had 500 People Is Down to Three
By Sonali Basak and Christopher Palmeri
30 April 2018, 22:49 GMT+5:30



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Current landscape: Post COVID-19

Bloomberg | Quint Markets Business BQ Blue Exclusive Videos Coronavirus Pandemic >

The Alarming Rise of Algorithms as Heroes of the Stock Recovery

Sarah Ponczek

Bookmark

Published on May 07 2020, 3:30 PM
Last Updated on May 07 2020, 6:02 PM



(Bloomberg) -- Ari Rubenstein knows it's an opinion people don't want to hear. That two decades of computer takeovers on exchanges, advancements that put thousands of people out of work and left high-frequency traders like him in control, are what kept markets humming during the coronavirus.

INVESTING

Learning Automated Trading Can Give You a Major Investing Advantage

Use machine learning and quantitative trading to limit your losses and maximize your dividends.



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Image credit: Jason Briscoe



Source: bloomberg.com



COVID-19 Jobs & Resources

The big finance hiring during COVID-19 is not in banks

by Sarah Butcher 06 May 2020



Printed from

THE TIMES OF INDIA

JP Morgan to hire 4k techies in Indian units

TNN | May 13, 2021, 07:27 AM IST



BENGALURU: JP Morgan said it is looking to add around 4,000 experienced technologists in India this year. It currently has over 35,000 employees in technology and operations across Bengaluru, Mumbai and Hyderabad. These centres support the investment bank's global operations.

Gaurav Ahluwalia, head of HR India corporate centres in JP Morgan, said, "Technology is critical to our client success and business strategy. We are always looking to grow our talent to support this, including in areas such as cloud, big data, AI, machine learning, digital platforms and cybersecurity." A majority of the hiring would be in Bengaluru and Hyderabad tech centres, sources told TOI.

Pros and cons of quant trading

The pros...



- **Speed** : With automation, not constrained by the limits of human cognition
- **Efficiency**: No need to constantly monitor screens. So you can instead research and test newer strategies to build a portfolio of profitable strategies
- **Scalability and up-time**: Can run multiple strategies on hundreds of instruments simultaneously. And no bathroom or smoke breaks! :)
- **Trading minus emotions**: Once a strategy has been deployed, we let it run. So (if we don't override the trading positions it makes!), we don't get swayed by greed or fear when markets jump around
- **Backtesting**: Helps evaluate how a trading strategy works on historical data and that should hopefully tell us how it'll perform in live markets
- **Richer metrics used in analysis**: Keeping track of numerous statistical metrics like gross leverage, drawdown, monthly performance, Sharpe/Sortino ratios, equity curve, etc. With discretionary trading, we usually don't look much beyond the P&L

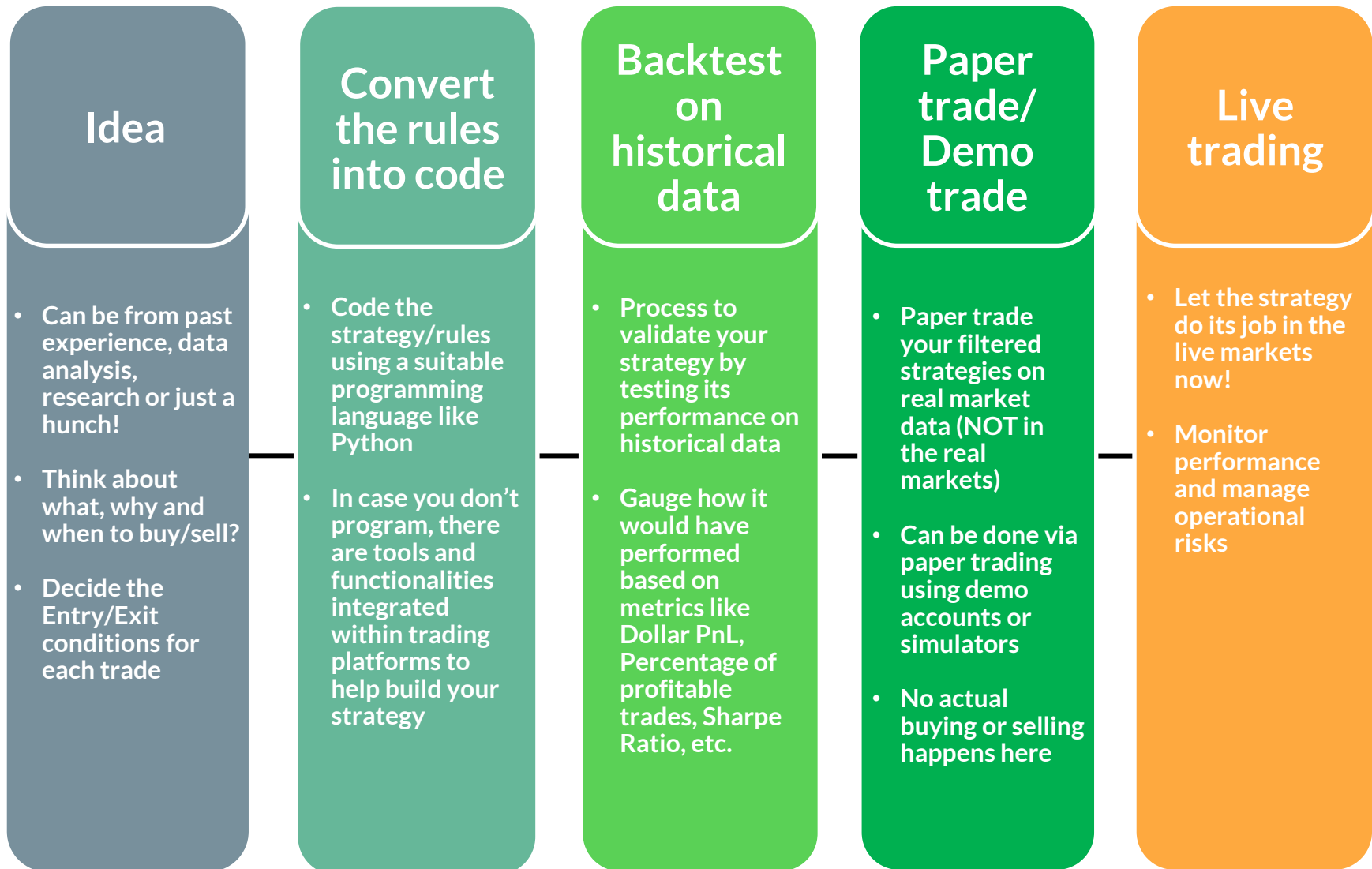
...and the cons



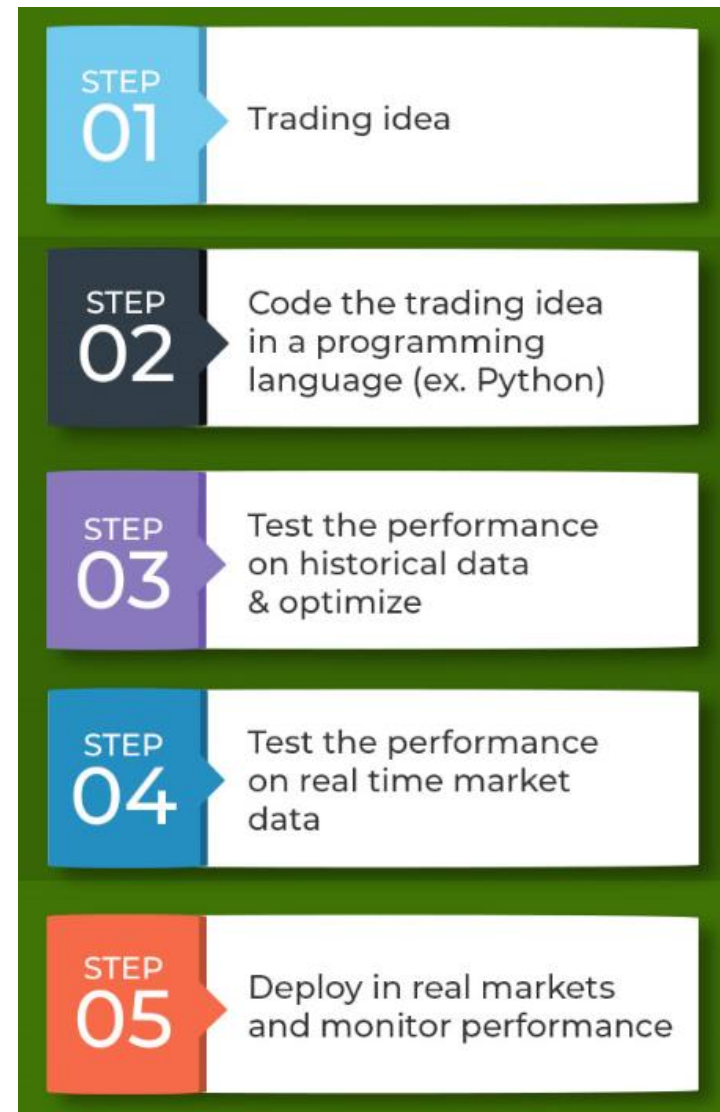
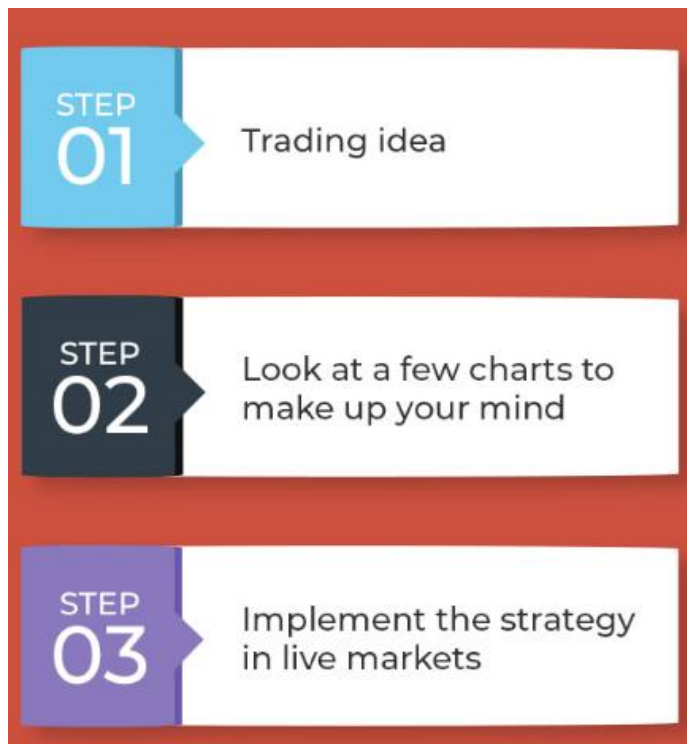
- **Capital requirements:** Usually higher compared to retail manual trading. Access to intraday machine readable data feeds can be an additional cost.
- **Infrastructure costs:** High performance computers, reliable internet connectivity, power backups, cloud infrastructure can be an additional overhead. These costs are dropping quite rapidly!
- **Skill gap:** Need to be relatively comfortable with programming, statistics and math. It takes time, effort and mentorship to build them. Can be an entry barrier.

Steps to build a quant trading strategy

Steps to build a quant trading strategy



Traditional vs Quant approach



Redux: Benefits of the quant approach

Benefits of the quant approach

Trading minus emotions

- Remain unaffected by 'greed' and 'fear'
- Stick to the strategy with discipline

More scientific approach

- Efficiently utilize the power of data via backtesting and forward testing

Avoid human errors and physical limitations

- Machines can work 24 hrs with same efficiency

Scan many markets for opportunities

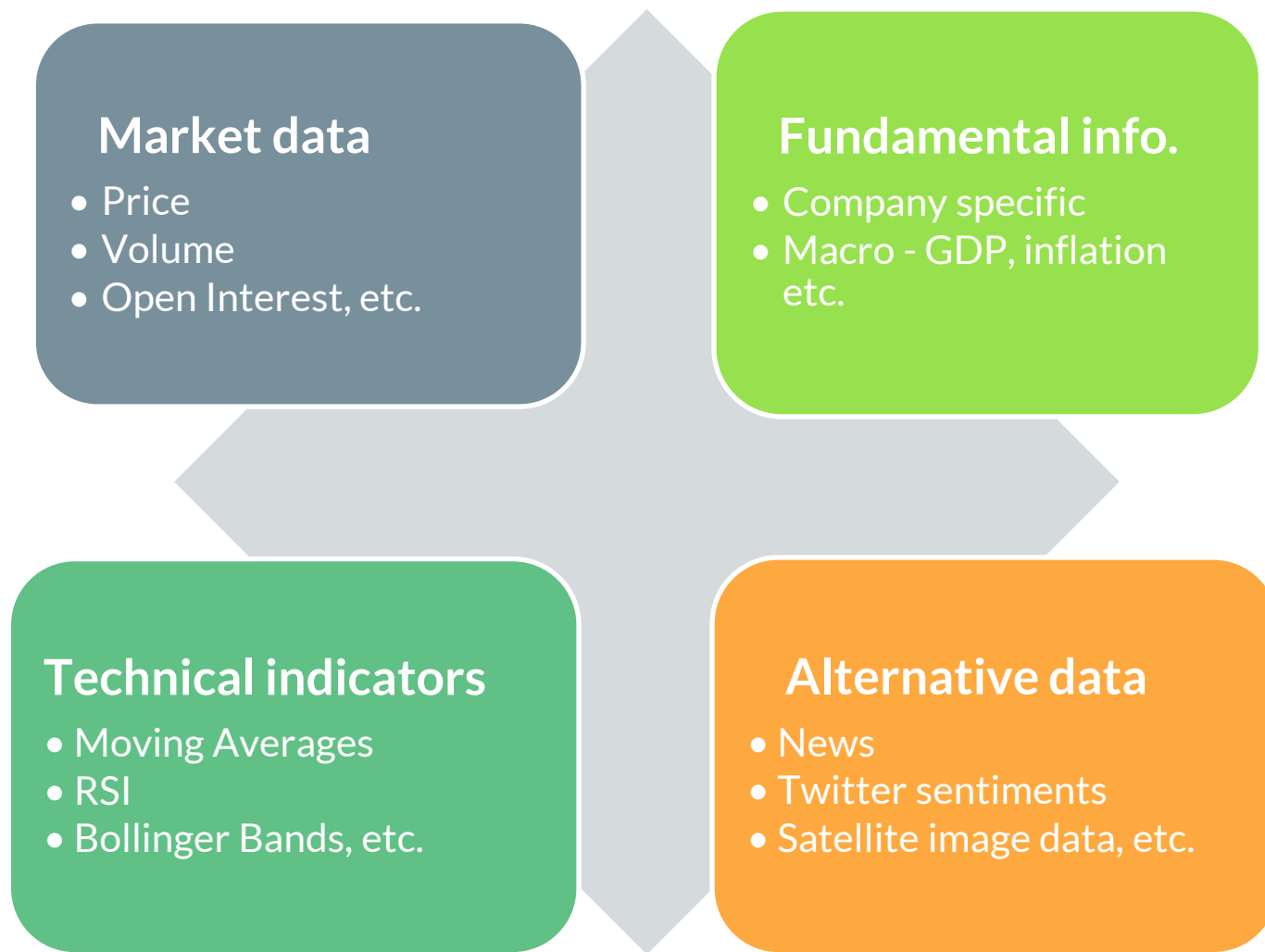
- Machines can monitor prices of tens of thousands of instruments in parallel

Grab those opportunities with speed

- Machines can respond to opportunities in microseconds

Types of data inputs

Types of data inputs





Timeline: How Elon Musk's tweets played with Bitcoin values

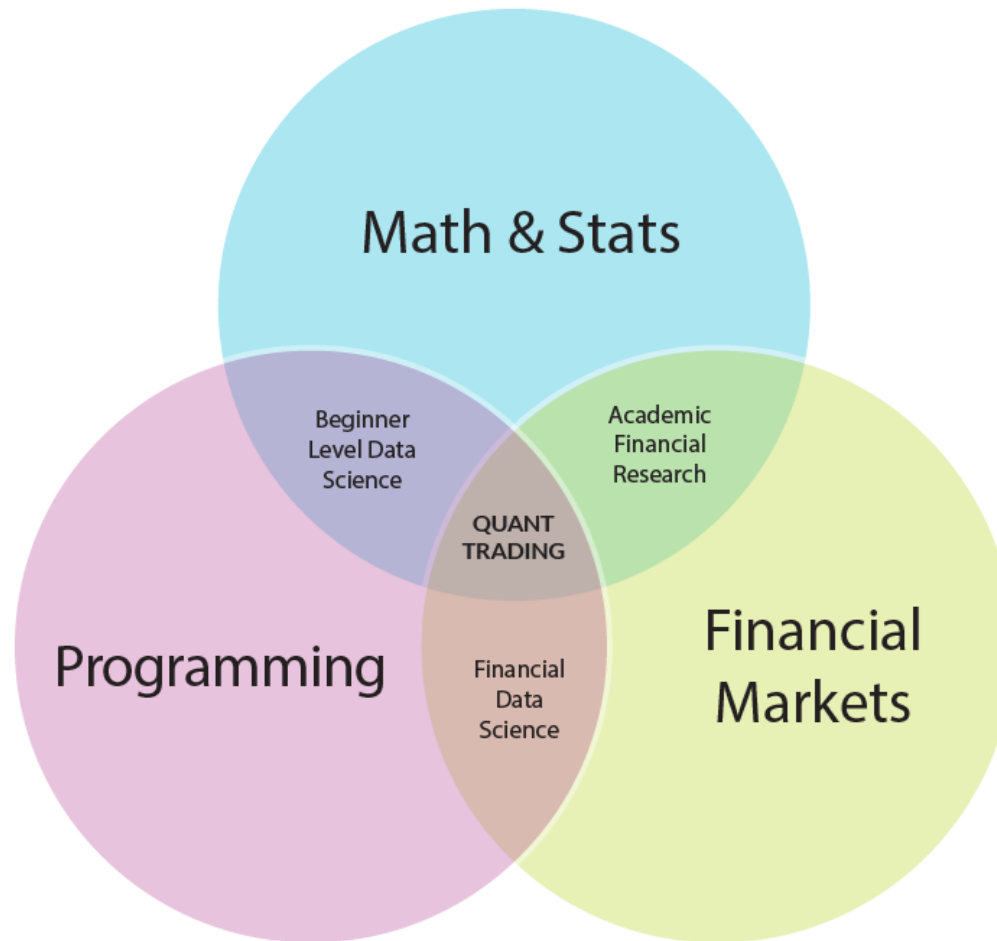
Updated : May 19, 2021 20:32:32 IST

- › Bitcoin valuation slid to \$45,000 on May 17 after hints that Musk may sell his crypto holdings
- › Musk had earlier announced Tesla would stop accepting Bitcoin payments for its cars citing environmental concerns
- › In Dec 2020 Musk had tweeted about converting 'large transactions' of Tesla's balance sheet into Bitcoin



How do I get there?

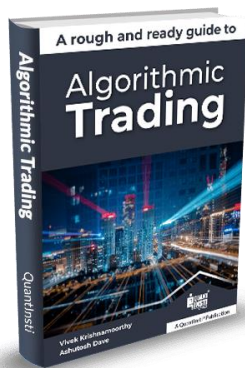
The Quant trading Venn diagram



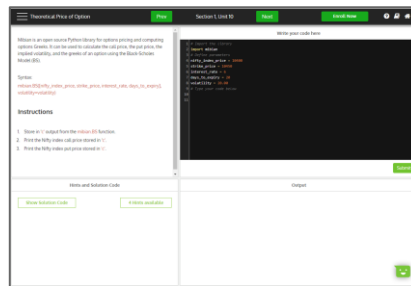
- Unlike the perception, algo trading does not have to be complicated!
- Some of the most successful strategies have very simple ideas like averages and standard deviations behind them.
- There are no shortcuts
- It's not a sprint, it's a marathon

Continue the learning

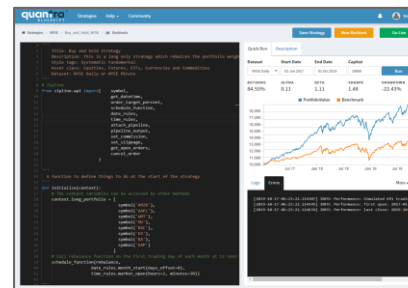
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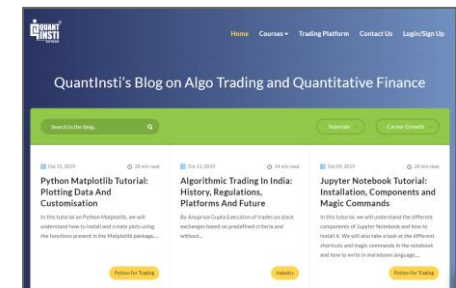
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Blogs

What's in store tomorrow?



- Understanding the quant research process
- Developing a sample strategy
- Back-testing the sample strategy in a research environment



Q and A



**Thank you for
your time and
attention. :)**



Complete Recording of Day 1