

ALGORITHMIC TRADING

- Trading is dam crazy !!

Rishika Palakonda
Pranav Chaudhari
Saeel Nachane
Samarth Vashisht

INTRODUCTION

Process of using computer program that follows a set of instructions for placing trades in order to generate profits at a speed that is impossible for the human trader

Quantitative Trading, High Frequency Trading, Automatic Trading, Black-Box Trading

"INSTRUCTIONS" → Timing, price, quantity or model

Makes market more liquid and trading more systematic





BENEFITS

- Trades executed at the best price
- Instant and accurate trade order placement
- Timed instantly and correctly
- Reduced transaction costs
- Simultaneous automated checks on multiple markets
- Reduced risks of manual errors
- Backtest the algorithm, based on the available historical and real time data
- Removes the emotional and psychological factor

HIGH FREQUENCY TRADING (HFT)

Automated trading platform that large investment banks, hedge funds and institutional investors employ.

Uses powerful computers to transact a large number of orders at extremely high speed.

Scans multiple markets and exchanges in a matter of seconds thus giving an advantage in open market



FEATURES OF HFT

- Use of sophisticated computer programs
- Use of co-location services and individual data feeds to minimize network and other latencies
- Very short time-frames
- Submission of numerous orders that are cancelled shortly after submission
- Ending trading day → Flat position as possible

Algorithmic High Frequency Trading

- Algorithmic Trading on steroids
- Tiny profits on each trade by capitalizing on the price discrepancies for the same stock or asset in different markets
- Opposite to that from traditional long-term buy and hold investing.
- Integral part of the financial markets



Risks in Algo-HFT

- Amplification of systemic risks
- Errant Algorithm
- Huge Investor Losses
- Loss of Confidence in Market Integrity

Measures to Combat "RISKS"

- Protective measures
- NASDAQ OMX group → "kill switch" (pre-set exposure)
- Circuit Breakers
- Controversial provisions → "Source Code"

PATHWAY FOR ALGO-HFT

1. Create a Trading Platform
2. Develop and Visualize your Trading Algorithm
3. Define Time Frame and Trading Frequency
4. Backtesting the algorithm
5. Connect algorithm to a Live Trading Account



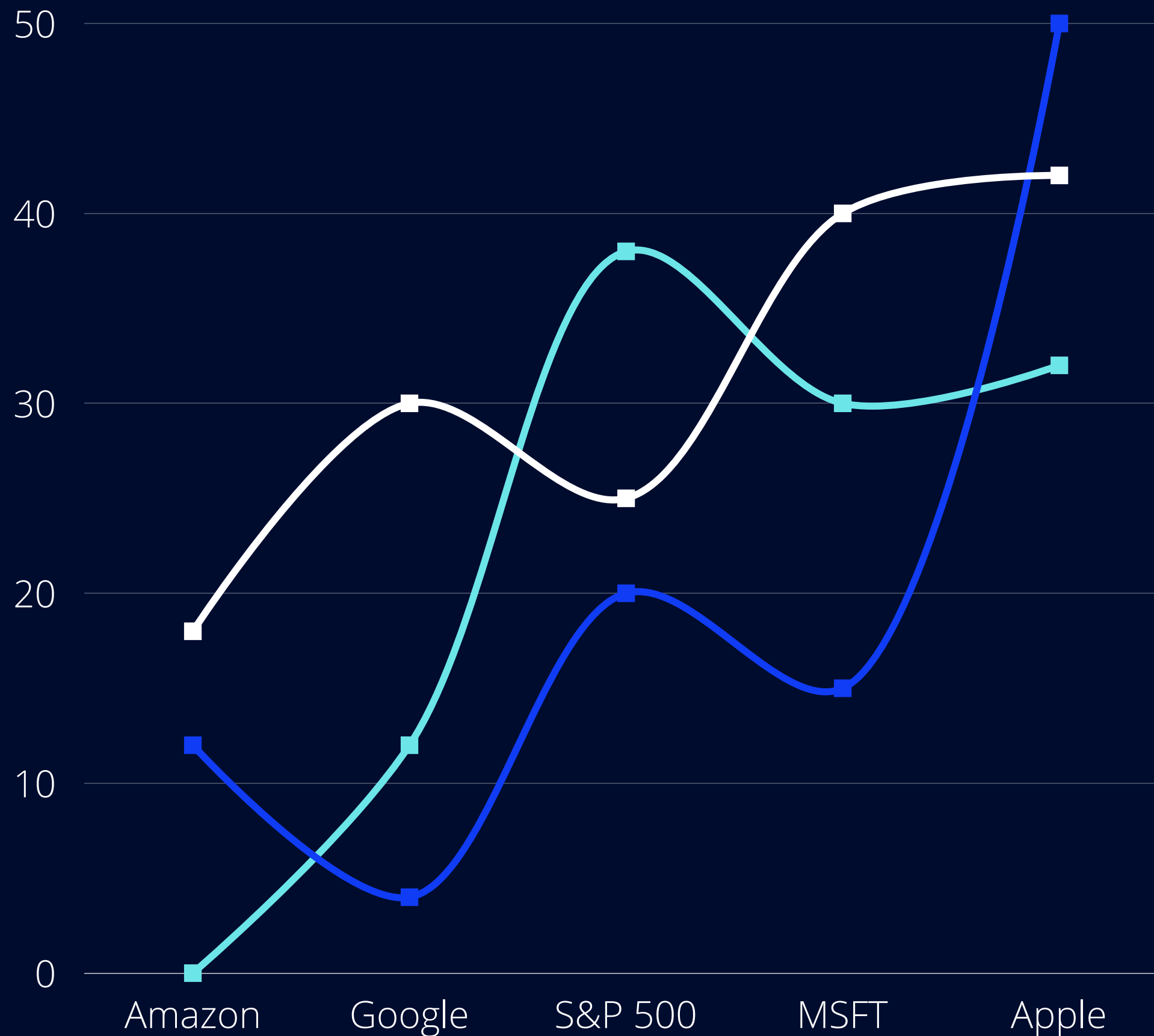
Trading Strategies

- Trend Following Strategies
- Arbitrage Opportunity
- Index Fund Rebalancing
- Mathematical-Model Based Strategies
- Mean Reversion (Trading Range)



Trading Strategies

- Volume-Weighted Average Price
- Time-Weighted Average Price
- Percentage of Volume
- Implementation Shortfall



BACKTESTING

Feeding historical data to trading strategy to see how it would have performed which would tell us what to expect from its future performance

REASONS

- Filtration
- Modelling
- Optimization
- Verification

Common Back-testing Biases

- Optimization Bias (curve fitting or data-snooping)
- Look-Ahead Bias
- Survivorship Bias
- Cognitive Bias

OPTIMIZATION BIAS

- Involves adjusting or introducing additional trading parameters
- "Curve fitting" or "data-snooping" bias
- Hard to eliminate → involves many parameters
- Minimise by:
 - Low number of parameters
 - Increasing the quantity of data points
- Sensitivity analysis
 - Varying parameters incrementally
 - Plotting a "surface" of performance
 - Jumpy surface → unnatural phenomena



LOOK-AHEAD BIAS

- Occurs when future data is present in the training set
If we are running the backtest chronologically and we reach time point N , then look-ahead bias occurs if data is included for any point $N + k$, where $k > 0$.
- Technical Bugs → Array/Vector indices
- Parameter Calculation → Linear Regression

SURVIVORSHIP BIAS

- Occurs when strategies are tested on datasets that do not include the full universe of prior assets
- Only consider those that have "survived" to the current time
- Another specific case of Look-Ahead Bias
- Minimise by:
 - Survivorship Bias Free Dataset
 - Use More Recent Data



LIVE EXECUTION

- Emotional Ups and Downs
- Technical Issues
- Appropriate broker
- Market and Operational Risks
- Simulated Trading → Live Market Data but no real money



BOTTOM LINE

It is entirely plausible for inexperienced traders to be taught a strict set of guidelines and become successful. However, aspiring traders should remember to have modest expectations.

Lieu stresses that the most important part of algorithmic trading is “understanding under which types of market conditions your robot will work and when it will break down” and “understanding when to intervene.”

Algorithmic trading can be rewarding, but the key to success is understanding.

A dark, moody background image showing a person in a suit and tie, seen from the chest down, writing on a document with a pen. Their hands are positioned in the center of the frame. In the foreground, the top of a laptop keyboard is visible, slightly out of focus. The overall color palette is dark blue and black, with a bright cyan color used for the word 'THANK' in the text overlay.

THANK YOU

Trading is dam crazy!!!

OUR WORK

Notebook: <https://colab.research.google.com/drive/1WAV8pYVLnHdgCPeb4TJ7mrD9fMWWP6x1?usp=sharing>

We used yahoo finance to import the details of 5 stock tickers, namely Google, Amazon, Microsoft, Apple, and Facebook. The details include the Date, Open price, High price, Low price, Close price, Adjusted Close price, and Volume of each stock ticker. We then used the Close price of each ticker to analyze the price variability from the start of the year 2022 to the 18th of July 2022 and then compared them by plotting them all in one graph. We used candlestick patterns for each ticker to see the day's open, high, low, and close prices. Then, we took the adjusted close price of each security and concatenated them to create a pandas data frame. Further, we calculated each security's daily returns and daily returns global statistics. We plotted the daily returns and adjusted close prices of each security side-by-side in subplots to compare them. We calculated the coefficient correlation and p-value for every pair of 5 securities. Through its analysis, we concluded that Google and Microsoft have been trending similarly over the past few months. We also calculated the cumulative returns of each security. We then tried creating two portfolios and calculated and analyzed their cumulative returns and Sharpe ratio to make our conclusions.