Tutorial 9 - Question 2

(Case: Algo trading and Crossing Networks)

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a) **In what ways do you think algorithm trading has helped in the growth of crossing networks?**

Crossing Networks

- Network system that matches block trades anonymously
- Limited or no trade information provided
- System matches and determines the transacted price based on a variety of parameters
- No negotiation
- Prevents information leakage

Growth of Crossing Network

- Crossing networks were originally designed as venues where large, uninformed traders could transact **large blocks of shares** with each other without moving the markets.

  ↓ Growth

- **Decreasing** average size per trade
- Block trades are becoming **less frequent**
- Suite management tools allows simple large orders to be broken down and parsed out over multiple venues across a period of time to minimize price impact
- Improved liquidity and made prices more efficient

Growth of Crossing Network

- Buy-side managers are concerned with disclosing too much information about their proprietary trading strategies
- Algo-trading to slice their orders to mask their strategies
- Computer programs explicitly designed to detect such strategies
- HFT further pushed the growth by exploiting the price differences between exchanges and crossing networks with the high execution speed of algorithms

Growth of Crossing Network

- Organisation develop algorithms to ping the market
- Collect statistics of liquidity and to sniff out large orders
- When several small orders are filled, it signals the discovery of a large iceberged/hidden order.
- Algorithms like seeking and sniping

Conclusion

- Algorithm trading and crossing networks are both on the rise, gaining huge amounts of popularity
- Crossing networks are advantages because:
  1. Low commissions
  2. Provide anonymity for the buying or selling account
  3. Avoid market impact of trades

b)
The article argues that not all algorithms are well designed and some algorithms fail to mask the true intentions of the trader liken that of an "embarrassed" human trader.

Do you think algorithm trading can replace human traders?

In what areas (e.g. asset classes, trading characteristics) do you think such a replacement is possible or not possible?

Do you think algorithm trading can replace human traders?

OUR STAND

No, Algorithm Trading **CANNOT** fully replace human traders.

While the majority of the trading can be made by algorithms, human traders should still be present.

Benefits of Algorithm Trading

BENEFIT 1 Fast Speeds of Prediction and Reaction to Market Signals

BENEFIT 2 Not prone to manual, physical and emotional errors

1. Fast Speeds

A. Fast Speed of Prediction

Algorithms are able to make accurate predictions based on massive amounts of data in a short amount of time

What might take a human brain an entire day to figure out can be done in a matter of seconds by an algorithm

B. Fast Speed of reaction to Market Signals

Algorithms are able to react fast In volatile markets where the market signals occur in intervals and are too short for human traders to keep up and respond effectively to.
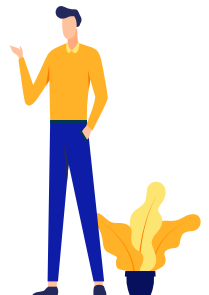
2. Algorithm Trading not prone to manual, physical and emotional errors

While algorithm trading is not prone to these errors,

Human traders are prone to manual errors, emotional and psychological influence on trading decisions, no matter their level of experience and expertise.

Why is Algorithm Trading not prone to manual, physical and emotional errors?

Algorithmic trading helps **preserve discipline** as the trade rules are set, and trade execution is done automatically after.

Factors like the desire to make more profit from a trade or the fear of making a loss can lead to a loss of discipline.

Incorporating algorithmic trading ensures discipline is maintained as the trading plan is automated and follows the set rules.

A human trader is susceptible to risks of not wanting to place a trade order for fear of further losses even if the next trade would have won.

However ...

Algorithm Trading has its downsides.

These downsides may not be faced or can be made up for by Human Traders.

Downsides that are not faced or can be made up for by Human Traders

DOWNSIDE 1   Algorithm Trading prone to errors not faced by Human Traders

DOWNSIDE 2   Algorithm Trading are less adaptable compared to Human Traders

DOWNSIDE 3   Algorithms used are built by Human Traders and often require instructions from Human Traders

1. Algorithm Trading can be prone to other forms of errors

Algorithmic trading could be prone to:

1. Errors in Training data

2. system failures, and

3. Bugs,

that can have a cascading effect on the trade outcomes

These errors, are not experienced by Human traders.

2. Algorithm trading are less adaptable

A. Adaptability to Sudden Fluctuations

Unlike Algorithm Trading, Human Traders are able to extensively monitor data to deal with sudden fluctuations that are not based on historic data and trends

- While algorithms can be used to predict where the market is headed, it is often difficult to project how market participants will respond to other elements that move the markets such as rumors, hype and news

2. Algorithm trading are less adaptable

- On the other hand, **human traders can make changes based on what's been observed even if it is not inline with historic data and patterns**
  - An example could be knowing when to place a different trade depending on the news. A human trader can quickly spot the fluctuations, something that the algorithms cannot do.

2. Algorithm trading are less adaptable

B. Adaptability to new market behaviour

- Unlike sudden one-off fluctuations, new market behaviour may become the new market trend.
  - There will then be a need to adjust trading techniques.
  - Algorithms can only learn historical data and trade patterns → But the stock market's behavior constantly changes and trading techniques require adjustment

2. Algorithm trading are less adaptable

- Easier and more efficient for Human Traders to adjust then to adjust algorithms
  - While **experienced human traders can quickly and easily adjust themselves to changes**, adjusting trading algorithms are often expensive, and time consuming
  - Should the algorithms not be properly adjusted, problems like the one stated in the question could surface

3. Algorithms used are built by Human Traders and often require instructions from Human Traders

Human traders provide the instructions for algorithms and fundamentally are the ones who build and adjust the algorithm

- In most instances, the human instructs the algorithm to buy X when the price/profit/loss reaches a certain threshold or sell Y when certain parameters are met.
- The selection of data to feed into the algorithm, and the building of the algorithm are also done by humans. These are factors that have to constantly be adjusted.
- Algorithms if left with no instructions or not constantly adjusted, may cause problems such as the inability to mask the true intention of the trader

Summary

Despite the benefits provided by Algorithmic Trading (Benefits 1, 2) , it cannot be used alone.

Algorithms used in Algorithmic trading may not always be sufficiently well-designed and error-free (Downside 1).

Even if well designed, it may not be quick to adapt to sudden fluctuations (Downside 2). It may also not always remain well designed due to changing market behaviour. Constant adjustment of these algorithms will be expensive(Downside 2).

These algorithms ultimately would still rely on human traders who build, adjust and provide them with instructions (Downside 3).

Without Human Traders, some algorithms may end up doing poorly, liken to an "embarrassed" human trader.

In what areas (e.g. asset classes, trading characteristics) do you think such a replacement is possible or not possible?

1. Availability of Market Data

- Historical market data is the fuel that powers algorithms, and most algorithmic trading models need **detailed market data stretching back over a period.**
- By definition, the amount and quality of **historical market data is more limited in less liquid markets** (such as bonds and OTC) because transaction data may be delayed in terms of reporting
  - E.g. Most bond transaction data in Europe is reported with a one-month time lag, with only a limited number of individual issues currently reported in realtime or with a 15 minute time lag).
- Therefore, in such markets, algorithms need a way to obtain these market data to fuel their algorithms before they can replace humans.

1. Availability of Market Data

- These market data can be obtained in 3 ways:
  - **Data from related and more liquid markets** can be used as a proxy for the less liquid instrument.
  - **'Artificial' data sets** with similar statistical properties to real market order and transaction data can be engineered.
  - **Machine learning algorithms** can be employed, to use **unstructured data** from other sources in order to enrich historic price information.
- These techniques of obtaining the data required to fuel the algorithm can be costly and difficult to execute.
- Thus, in areas where market data is not readily available, it is **difficult, but possible** for algorithms to obtain the data required for the algorithm trading and hence, replace humans.

2. Liquidity of Markets

- Hold time is the amount of time the asset is held by the investor.
- Typically, the **longer the hold time,** the **higher** the **market risk** associated.
- In markets with **higher liquidity**, like foreign exchange, this hold time is typically in seconds to minutes
- However, in **low liquidity** markets, these hold times may be in days or even weeks.
  - E.g. Markets for Treasury Bills, Bonds and certificates of deposits (CD).
- Thus, when entering low liquidity markets, the **market risk associated with algorithmic trading increases**

2. Liquidity of Markets

- Markets with low liquidity products are likely to be much more **concentrated**.
- This is because there are few non-bank market makers who are **willing to extend liquidity** in all market conditions.
- As such, when the economic conditions are bad, the algorithm needs to take into account the risks of **potentially disappearing liquidity,** and the market risks involved.
- Thus, due to the risks associated, it is **difficult** for algorithm trading to successfully replace humans in markets with lower liquidity.

3. Volatility of Markets

- In volatile markets, the market signals occur in intervals that are too short for human traders to keep up and respond effectively to.

- Especially common in **Energy Markets** because:
  - Reduced reliance on coal and the increasing growth of renewables causes the balance of demand and supply to constantly shift, resulting in more volatile energy markets.

- Under such volatile circumstances, algorithmic trading enables **better position management** because computers can analyze all available real-time data quickly.

3. Volatility of Markets

- Computers can sift through an abundance of real-time market data, revealing opportunities, trends, and potential risks in energy markets around the world in seconds.

- The computer can **generate trades based on these analyses** immediately, generating profits at a speed and frequency that is impossible for human traders to achieve.

- Thus, it is **possible** for algorithm trading to replace humans in these **volatile sectors**.
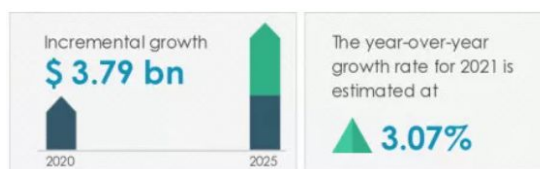
Summary

	Possible	Difficult
Availability of Market Data	Data Readily Available	Data Not Readily Available
Liquidity of Market	High Liquidity	Low Liquidity
Volatility of Market	High Volatility	Low Volatility

c) Do you foresee algorithm trading to be a strong driving force in Singapore's equity trading markets? Why or why not?

Some statistics on Algorithm Trading...

- 80% of the daily moves in U.S. stocks are machine-led. Machines are causing sharp drops and rallies based on immediate data releases.

- Expected forecast: The algorithm trading market has the potential to grow by USD 3.79 billion during 2021-2025, and the market's growth momentum will accelerate at a compound annual growth rate (CAGR) of 5.98%.

Incremental growth
$ 3.79 bn
2020   2025

The year-over-year growth rate for 2021 is estimated at
▲ **3.07%**

1. Efficiency of Trade Execution

- Algorithm trading facilitates trades to be executed at the best possible prices.

- It allows the trade order placement to be instant and accurate (there is a high chance of execution at the desired levels). This is even more crucial for market makers or day traders.

- They continuously check market conditions and have a very minute chance of failure.

2. Technological Advances

- Increase in availability of technology tools such as artificial intelligence and machine learning, together with the use of big data can be capitalized by Algorithm Trading

- Coupling the ever-present growth in computing power with the decreasing cost of data storage, algorithm trading is becoming an increasingly available and inexpensive addition to the investing processes of everyday investors.

- Algorithm trading has become a realistic option for everyday investors

## 3. Volatility in the market which increases need for risk management

- Algorithm trading includes aspects such as back-testing, where individuals can run their strategy and see potential outcomes.

- Risk management in algorithm trading allows setting limits at multiple levels and having simultaneous automated checks on multiple market conditions.

- Reduced risk of manual errors when placing trades

Despite the strong push factors for algorithm trading to be dominant throughout the world, our team still feels that algorithm trading will not be a strong driving force in the Singapore equities market

1. Volatility of stock prices in Singapore is less than the US market
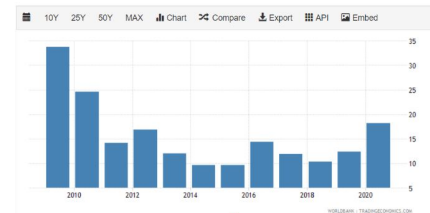
Volatility of Stock Price Index for Singapore
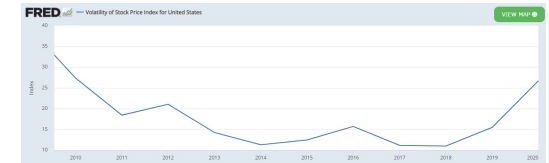
Volatility of Stock Price Index for United States

- Volatility is ideal for investors trying to make money in choppy markets, allowing them to gain short-term profits from swing trading.

2. High trading costs

- In 2013, SGX launched a new and ultra-fast trading engine called "SGX Reach," in a bid to attract High Frequency Trading (HFT) traders. However, it was unsuccessful.

- Fees for trading on the Singapore Exchange amount to about 20 percentage points of the value of shares traded, compared with Sydney-based ASX's 15 percentage points (Burgos 2013).

- High trading fees will further lower the already narrow profit margins earned by HFT traders.

3. Small financial market

- Singapore does not have a fragmented financial market like the U.S. does. Singapore only has 1 stock exchange.

- With only 1 exchange, there is no arbitrage opportunity existing among different trading venues for equities.

- The only arbitrage opportunities that exist are mainly in the derivatives market, where high-frequency traders can exploit inefficiencies involving parallel products that trade elsewhere in the world.

THANK YOU!

References

https://www.sec.gov/divisions/riskfin/seminar/nimalendran090612.pdf

https://economictimes.indiatimes.com/markets/stocks/news/how-algorithms-are-going-to-change-the-way-you-buy-and-sell-stocks/articleshow/85532682.cms?from=mdr

https://tradingeconomics.com/singapore/stock-price-volatility-wb-data.html#:~:text=Stock%20price%20volatility%20in%20Singapore,compiled%20from%20officially%20recognized%20sources

https://fred.stlouisfed.org/series/DDSM01USA066NWDB

ttps://www.virtual.prosperoevents.com/blog/can-algo-trading-replace-human-traders-in-energy-markets#:~:text=Algorithms%20are%20just%20more%20efficient,for%20human%20traders%20to%20achieve.

https://tradeveda.com/algorithmic-trading-vs-human-traders/#Preserves_Discipline

https://www.financemagnates.com/thought-leadership/can-robots-replace-day-traders-on-wall-street/

https://www.financemagnates.com/thought-leadership/can-robots-replace-day-traders-on-wall-street/

https://blog.quantinsti.com/algorithmic-trade-execution-different-asset-classes/

https://fmsb.com/wp-content/uploads/2020/04/FMSB-Spotlight-Review-%E2%80%98Emerging-themes-and-challenges-in-algorithmic-trading-and-machine-learning%E2%80%99.pdf