## Case 3 Fraud Detection In Stock Market

## A. Introduction and Background

In the heart of the global financial district, where the pulse of markets beats in synchrony with the ceaseless flow of information, stands Global Stock Exchange, a pivotal hub in the world of financial trading. At the forefront of this influential institution is CEO Jonathan Harris, a visionary leader known for navigating the complexities of the ever-evolving market landscape.

As whispers of a growing concern reached Harris's ears, a shadow loomed over Global Stock Exchange's credibility. Circular trading, the unethical practice of orchestrating trades among multiple colluding parties or accounts to artificially inflate trading volumes or manipulate prices, posed a significant threat, jeopardizing the integrity and trust upon which the stock exchange had built its foundation.

Recognizing the gravity of the situation, Harris wasted no time in convening an emergency meeting with the board. Harris, with a furrowed brow, addressed the board, outlining the urgency of addressing the front-running issue before it eroded not only the profits but also the faith of investors and partners in Global Stock Exchange.

In attendance were key figures, including Sarah Martinez, the Head of Compliance, whose responsibility extended to safeguarding the stock exchange against regulatory risks. Her concern mirrored that of the CEO's, acknowledging that circular trading not only posed financial threats but also regulatory scrutiny that could tarnish the reputation of Global Stock Exchange.

Amidst the dialogue, Emily Chang, the Chief Data Scientist, expressed the need for a cutting-edge solution. "We must leverage innovative analytical approaches to stay a step ahead. We cannot allow our systems to be outsmarted by those engaging in illicit circular trading activities," she urged.

The board, collectively sensing the gravity of the situation, embarked on a mission to fortify Global Stock Exchange against circular trading threats. Little did they know that this journey would lead them to collaborate with leading experts and employ innovative solutions to protect the integrity of their operations and restore confidence in the financial markets they facilitated.

## B. Challenge

The problem of circular trading in the stock market is a significant concern due to its potential to harm investors and the integrity of the exchange. When investors believe that the market is not fair or transparent, they may be less likely to invest. This can lead to a decrease in trading volume and revenue for the exchange, as investors may choose to take their business elsewhere.

Circular trading fraud presents the challenge, where numerous orders may be orchestrated among colluding parties or accounts, making it difficult to identify which trades are artificially inflating volumes or manipulating prices. The fast-paced nature of the stock market and the use of complex trading algorithms can further complicate efforts to detect and thwart these illicit activities.

The challenge of circular trading can be framed as a process of recognizing behavioural patterns indicative of fraudulent activity. Once suspects are flagged, a subsequent phase of rigorous investigation ensues, aimed at accumulating additional evidence to construct a robust case against the identified individuals or entities.

In pursuit of these objectives, the project’s primary aim is to describe and detect patterns exhibited by individuals or entities likely engaged in circular trading. The specific objectives may include identifying anomalous trading volumes or repetitive trading patterns among associated parties for a given scrip on a particular day, and subsequently pinpointing potential orchestrators of circular trading. This methodological approach empowers regulators and compliance teams to proactively detect and prevent circular trading fraud, minimizing the necessity for manual intervention and fostering a more secure trading environment.

Assumptions may be made as necessary to solve the problem and should be stated clearly.

## C. About Data

Two datasets, namely orders and trades, are provided. The order dataset, also known as the order book, contained all the orders placed during the trading period, while the trade dataset, also known as the trade book, contained records of all the orders that were successfully executed.

The order book had a total of 602,473 observations and 14 columns, while the trade book had a total of 414,957 observations and 20 columns over a period of seven days for four different scrips.

Order dataset:

1. ORDER\_SEQUENCE: Unique identifier for each order.
2. ORDER\_ID: Identifier for the order.
3. ORDER\_TIME: Time at which the order was placed.
4. ORDER\_DATE: Date on which the order was placed.
5. SCRIP\_CODE: Code representing the specific stock or security.
6. MEMBER\_CODE: Code identifying the member or broker placing the order.
7. CLIENT\_ID: Identifier for the client placing the order.
8. BUY\_OR\_SELL: Indicates whether it's a buy or sell order.
9. RATE: Price or rate at which the order is placed.
10. QUANTITY: Total quantity of shares or securities in the order.
11. AVAILABLE\_QUANTITY: Quantity of shares available for trading.
12. TRADER\_ID: Identifier for the trader handling the order.
13. TERMINAL\_ID: Identifier for the trading terminal.
14. LOCATION\_ID: Identifier for the location.

Trade dataset:

1. TRADE\_SEQUENCE: Unique identifier for each trade.
2. TRADE\_NUMBER: Identifier for the trade.
3. TRADE\_TIME: Time at which the trade occurred.
4. TRADE\_DATE: Date on which the trade occurred.
5. SCRIP\_CODE: Code representing the specific stock or security.
6. BUY\_MEMBER\_CODE: Code identifying the member or broker who bought the shares.
7. SELL\_MEMBER\_CODE: Code identifying the member or broker who sold the shares.
8. BUY\_CLIENT\_ID: Identifier for the client who bought the shares.
9. SELL\_CLIENT\_ID: Identifier for the client who sold the shares.
10. BUY\_ORDER\_ID: Identifier for the buy order associated with the trade.
11. SELL\_ORDER\_ID: Identifier for the sell order associated with the trade.
12. BUY\_TRADER\_ID: Identifier for the trader who placed the buy order.
13. SELL\_TRADER\_ID: Identifier for the trader who placed the sell order.
14. TRADE\_QUANTITY: Quantity of shares traded.
15. TRADE\_RATE: Price or rate at which the trade occurred.
16. TRADE\_VALUE: Total value of the trade (trade\_quantity \* trade\_rate).
17. BUY\_LOCATION\_ID: Identifier for the location of the buying member.
18. SELL\_LOCATION\_ID: Identifier for the location of the selling member.
19. BUY\_TIMESTAMP: Timestamp indicating when the buy order was placed.
20. SELL\_TIMESTAMP: Timestamp indicating when the sell order was placed.

The case should cover the following area with project code/ workflow, PDF document and short PPT for final presentation.

|  |  |
| --- | --- |
| Sr. No | Method |
| 1 | Identification of Business Problem |
| 2 | Data Preparation and Availability |
| 3 | Proposed Approach |
| 4 | Data Analysis |
| 5 | Conclusion and Findings |