

Stock Exchanges: What do we need to watch?

Ashok Jhunjhunwala, Institute Professor, IIT Madras

Stock Exchanges, Depositories, Settlements

- Are now all essentially Connected Computers, Software and Storage
 - Trading of stocks, commodities, foreign exchange, futures and options, mutual funds and other Financial Instruments are all technology dependent
 - Technology, Policies and Practice are of paramount importance
- To what extent do the Regulator have control?
 - Can we ensure it is up all the time with **zero-fault transactions**?
 - Can we **assure** fairness?
 - Can we be **certain** that there can be no frauds?
 - Can we **detect** attempts to manipulate?

Denial of Service

- Any fault bringing systems down, any delay in log-in or delay in carrying out a transaction
 - Will be Denial of Service
 - Extends to brokers too
- When market was “Hot”
 - I could not log in in-time
 - Response time was too poor
 - Exchange just crashed
- In trading, it is a lost opportunity for the customer
 - Did it happen due to **poor** architecture, systems, software, infrastructure, communications?
 - Was this caused **deliberately**?
 - So as to corner opportunity for some
- Are we monitoring all such lost opportunities for every customer
 - Do customers get differential treatments?
 - SEBI should get exchanges to ensure that all their **brokers** have no DoS

Faults in Exchange / Software

- Hardware, Software or Network failure **bringing down** exchange
 - It is Denial of service to all customers
 - Just before Trading End of Day: settlements may not take place
 - What happened to Contracts executed just before failure?
 - **Were the records lost?** This would be catastrophic
- What happened to orders in queue?
 - **How long** before customer knows!
 - If the market changes when exchange recovers, will the orders be still executed?
- A Order getting executed **multiple times?**
 - **Most dangerous**
 - Execution of orders that a customer did not place
 - Would be curtailed only by limited money lien marked and limited stocks in DP
 - Wrong trade execution is blunder with **unlimited liabilities!**
 - Has to be avoided at all costs

Fairness in processing Orders

- Price-Time Priority
 - Order processed strictly on basis of **first come first serve** and price-match
- Is there a **single** entry **GATE** with all orders in line?
 - Electronic orders from different parts of the country with different communication pipes
 - Fibre-optics / wireless / satellite: with different delays
 - Different delays to reach entry gate
- Those in city of exchange are closer; those in nearby buildings are still closer; those within buildings are even closer
- And those **collocated** are **closest**
- Information travel close to velocity of light
 - $C = 3 \times 10^8$ m /sec or 3 μ sec per km
 - 3000 kms in about **10 msec**
 - **In reality more like 15 msec**
 - Satellite delays are in **seconds**
- Collocated High Speed computers can give **thousands of orders** in 10 msec
 - Even μ sec and nsec (10^{-9} sec) delays matter

Fairness (contd.)

- Then what does Time Priority **mean** in today's world?
 - Delays in getting **bid information** to reach a customer
 - And delays in **order reaching the Gate**
 - And then delays from multiple Gates to order-processing Engine in Exchange
 - Both way delays puts some customer at huge **disadvantage** vis-à-vis others
- Worse still
 - An exchange has multiple GATES and multiple queues even after entering
 - Some queue may be more full than other: longer delays
- Collocation
 - Certainly at great **advantage** as compared to others
 - **High-speed Trading (HSD)** through powerful computers processing incoming bid-information further put them at an advantage
- So why allow them?
 - They bring **liquidity** to market
 - More orders means more earnings for the exchange
 - May **attract** investment in stock market
- Should they be regulated better?

Undoubtedly

- Collocation and HST exists because it gives them **advantage** over others
 - Lower delays and getting **ahead** in queues makes a huge difference
- So
 - So apart from the advantage they already have, will unfair practices be used to get ahead in the queue?
 - Naturally there will be a **tendency to do so!**
- But can traders **manipulate** further to get ahead in the queue
 - Get information **first** and get order processed **ahead** of others
 - Yes, if they play with the system
 - Can we guard against this?
- Can we catch them?
 - Who is first to get access and how often?
 - Role of technology and data-analytics

Can companies **manipulate** their stock?

- To not reflect their performance
 - Manipulate **perception**
 - Create a **false** impression
- Data Analytics to look at all **rapid** rise and falls
 - Also at **large** rise and falls
 - Especially if **uncorrelated** to performance
 - Monitor performance by examining **all financials**
 - Work with banks and financial institutions
- For all such cases, analyse all company statements, pronouncements, market rumours
 - To figure out whether the rapid or large changes are due to **manipulations**
 - AI-ML and data-analytics gives us increasing ability
 - But needs to look not only at stock prices, but also all financials

Technology is
giving
increasing
ability

- To make systems and market more efficient
- But also to manipulate
- At the same time to monitor, detect manipulations and regulate
- Issue is who will stay ahead of technology curve