

Markets and microstructure

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Recap

- ▶ Market microstructure elements include:
 1. Products
 2. Participants
 3. Information access
 4. Trading, Clearing, Settlement
 5. Laws and regulation
- ▶ We looked at products, participants and information access.
- ▶ In this session, we think about trading, clearing and settlement.

Market designs for trading

- ▶ Being centralised vs. distributed: Exchanges (NSE/BSE) vs. Over-The-Counter (gold merchants, bond traders).
Centralised: advantage of pooling more supply and demand.
Distributed: advantage of better binding counterparty behaviour.
- ▶ Information access: How visible is the price, time, size, counterparty in an order, and in a trade.
More visibility: advantage of better prices.
Less visibility: ?
- ▶ Access: How easy is it to place orders, to do trades for all participants.
Greater access: advantage of pooling more supply and demand; heterogeneity of views in prices.
Lower access: ?

Market design for price discovery

Prices are discovered when orders are matched to generate trades.

Different market designs use different matching algorithms:

- ▶ **Limit order book markets:** orders can be matched on price, or price-time priority.
Trades happen as soon as an order satisfies the price of another order. (Exchanges)
- ▶ **Auction markets:** match orders on maximising volumes at a single price.
Orders are pooled over a period of time, and matched at one time. (Exchanges)
- ▶ **Dealer / Over-The-Counter markets:** match orders on the basis of price and counterparty (OTC).
Orders are collected at a “market maker / dealer” who can give priority to price and counterparty.
- ▶ **Market specialist:** One dealer collects all the orders (OTC).

Clearing and settlement

Counterparty risks in financial markets

- ▶ Clearing is separate from trading when trading is anonymous.
- ▶ The main job of the clearing system is to manage counterparty risk: that the counterparty will not make good her obligations.

This risk can arise at two places:

- ▶ 1. Intention to trade vs. Transaction:
 - ▶ Traders put in “orders” (an intent to trade)
 - ▶ Markets generate “trades” (completed transaction)

How to bind the intentions to the actual transaction.

- ▶ 2. Transaction vs. settlement:
 - ▶ Trades take place continuously, settlement does *not*.
 - ▶ Always a gap between agreeing on the trade and settling the trade.
 - ▶ When information changes, counterparties may renege on their promise.

How to bind transactions to settlement?

- ▶ Answer: “novation”

Novation: linking price risk and counterparty risk

- ▶ When the L and S trade, each is taking on mutual counterparty risk.
When prices fall, L has an incentive to default.
When prices rise, S has an incentive to default.
- ▶ “Domino effect” in defaults: the mechanism for contagion when one economic agent fails to settle.
- ▶ Triggered by
 1. Large unanticipated movement in price – direction is irrelevant.
 2. A long run in prices.
- ▶ A clearing corporation (CC) has a neat solution this problem: “Novation”.
- ▶ Legally, the CC is the counterparty: L buys from the CC, S sells to the CC.
 $L \rightarrow CC \rightarrow S$
- ▶ As long as the CC stands, there is no counterparty risk.
The risk of trade failure becomes risk of CC failure.

Risk management at the CC using margins

CC manages the risk by collecting margins from **both** counterparties.

- ▶ The CC recovers losses (and pays out profits) on a daily basis. This is the “mark-to-market margin”.
- ▶ The mark-to-market margin breaks a large multi-day loss into a series of small one-day losses, and reduces the profits from defaulting.
- ▶ Once this is done, the gains from declaring bankruptcy are limited to the losses made on one day.
- ▶ The one day losses that can be made on any given day is collected upfront, and is called “initial margin”.
The initial margin should cover the one-day price risk.

Volatility and initial margins

- ▶ The initial margin should be larger than the one-day loss “on most days”.
- ▶ In modern parlance, initial margin is a Value at Risk (VaR) on a one-day horizon.
- ▶ If the one-day rupee profit on a position is $x \sim f(x)$, then the VaR v at a 95% level is:

$$\int_{-\infty}^v f(x)dx = 0.05$$

- ▶ In India, the L. C. Gupta Committee (1998) recommended that initial margin at the futures clearing corporation should use VaR at a 99% level on a one-day horizon.

Issues in settlement

- ▶ Physical vs. cash.
- ▶ Physical settlement: requires infrastructure for rapid transfer of ownership of assets.
- ▶ Cash settlement: requires a transparent source for price of the asset.

Securities laws and regulation in India

- ▶ All securities trading in India are governed by the legal framework laid out in
 1. the Securities Contracts (Regulation) Act, 1956 (SCRA) and
 2. the Securities and Exchange Board of India, (SEBI) 1992.
- ▶ Exchanges as Self regulated organisations (SRO) vs. professionally managed organisations
 1. SRO: The exchange as an association of the intermediaries.
The management, dispute resolution and operations are in the control of the intermediaries.
 2. Professional management: clear separation between the management and members.
Management decisions, dispute resolutions, and operations are handled by third parties.

Comparing market microstructures

What outcomes to measure?

- ▶ Market microstructure research aims to understand how to generate *efficient* market outcomes:
 - ▶ Efficient prices.
 - ▶ Robust, resilient liquidity.
 - ▶ Accuracy of market risk, and efficient management.
- ▶ A change in microstructure can cause a change in any or all of these three outcomes.

For example, when NSE became a national electronic limit order book market in 1995, price discovery, liquidity provision and systematic risk improved significantly.

Evaluation approach

- ▶ When designing markets, ideally, we would like to compare alternative market designs and measure which one is more efficient; carry out a cost-benefit analysis for each.
- ▶ Parameters to measure
 1. Efficiency of prices: Tests of no-arbitrage; tests of the efficient market hypothesis.
 2. Robustness of liquidity: resilience of liquidity.
 3. Effectiveness of risk management: hedging efficiency or returns variance reduction.
 4. Costs of transactions: higher the transactions costs (TC), the less efficient are these market outcomes.
- ▶ How does the selected market microstructure deliver on these parameters?

An example of market microstructure: the National Stock Exchange (NSE)

Product design

- ▶ Multiple separate “markets”: EQ, WDM, SME, F&O-EQ, F&O-FX, IRF,
- ▶ EQ – shares, mutual funds, exchange traded funds (ETF) including commodity and fixed income, all bonds other than Central Govt. bonds.
- ▶ WDM – all bonds.
- ▶ SME – shares.
- ▶ F&O-EQ – futures and options on single stocks, indexes
- ▶ F&O-FX – futures on currencies (presently only on INR-USD)
- ▶ IFR – futures on interest rates (presently only short-term interest rate).

Trading

- ▶ Open Electronic Limit Order Book trading
- ▶ Trading opens at 9am and closes at 3:30pm.
- ▶ Trading opens with a “call-auction” between 9 and 9:10am.
- ▶ Normal market: continuous order matching by price-time priority.
- ▶ There are price limits on the highest/lowest prices during the day. Price limits are set based on the movement in the index, NSE-50 (“Nifty”).
- ▶ Trades between opening and closing can be “reversed” – this is called “day-trading”.

When a sale trade is done without the ownership of the asset, it is called “short-selling”.

Participants

- ▶ All trading happens through registered trading members of three forms:
 - ▶ TM (Trading Members): provide only trading services for their customers.
 - ▶ TCM (Trading and Clearing Members): provide both trading and clearing services for their customers.
 - ▶ PCM (Professional Clearing Members): don't offer any trading services, only provide “clearing services” for their customers who are typically other TMs.
- ▶ Jargon:
 - ▶ Trading members who do investments using their own capital: “proprietary traders”.
 - ▶ Financial institutions trade through “custodians”.

Clearing

- ▶ Clearing is done at a separate entity called the *National Securities Clearing Corporation Ltd.* (NSCCL).
- ▶ Clearing is done at the end of the trading day: only for all trades that are not reversed at the closing of the market.
- ▶ NSCCL provides “novation” for every trade.
- ▶ NSCCL collects “initial margins” from every counterparty – both the buyer and the seller – and mark-to-market margin when there is a loss.
- ▶ Margin is collected *before* the trade.
Margins are returned after settlement.

Dispute resolution

- ▶ Disputes arise when a trader cannot make good their settlement.
- ▶ NSCCL uses margins to make payments if a counterparty defaults.
- ▶ If margins are insufficient, NSCCL borrows/lends on behalf of the defaulting position, and heavily fines the defaulter.

Settlement

Settlement dates depends upon the product:

- ▶ EQ, SME: $T + 2$
- ▶ WDM: $T + 0, \dots, T + 2$
- ▶ F&O-EQ,FX,IRF: $T + 1$ for margins, depends upon the contract for actual closure.

Laws and regulation

NSE is privately held, for-profit firm.

Governance is through a two-board structure:

- ▶ Board of Directors – with shareholders, stakeholders (PCM/TCM/TM) and management.
- ▶ Executive Committees – where policy decisions are taken on various functions at the exchange: exchange operations, surveillance, risk management.

An example of market microstructure: the Muzaffarnagar market for jaggery futures

Product design

- ▶ Trades only futures.
- ▶ Four contracts in a year.
- ▶ Typically:
 - 15th December to 15th July,
 - 15th November to 15th January,
 - 15th December to 15th March,
 - 15th February to 15th July.

The exchange has to get permission from the regulator to start each contract.
- ▶ Contracts are physically settled on one specific underlying grade of jaggery.

The unit of delivery for each contract is 4 tonnes.
- ▶ The price of the underlying is difficult to ascertain. The quantity of jaggery available in the market is difficult to determine.

As a result, there is a deep fear of *short-squeezes* in the market.

Trading

- ▶ Trading is through open–outcry.
- ▶ Two types of members who place orders: trading members and brokers.
- ▶ Trading times: 10am to 3pm.
Trading starts and ends with the ringing of a bell.
- ▶ Information access: bid–ask prices are polled and posted on a board half–hourly.
Polled price is an average of quotes from eight brokers, four on the buy and four on the sell side.
- ▶ The regulator sets price limits on each contract.
- ▶ Both counterparties to a trade do trade–recording in physical form, in duplicate.
One form is for the trader’s backoffice, the other is to be submitted to the exchange clearing house.

Participants

The exchange permits trading members and brokers:

- ▶ Trading members have clearing and settlement obligations with the exchange.
- ▶ Brokers have clearing and settlement obligations with trading members.

A trading member can have multiple brokers. Every broker can only trade through one trading member.

Clearing

- ▶ Clearing is through the clearing house, a department within the exchange.
- ▶ Clearing is done at the end of day.
- ▶ MTM profits/losses are calculated against a benchmark price that is calculated as the average of the open–high–low–close of the day.
- ▶ Officially, MTM loss has to be paid in before 11am the next day. Members typically pay by 12:30pm or 1pm.
- ▶ MTM profits can be paid to traders before 11am, but usually sit with the clearing house as buffer capital for future losses.

Dispute resolution

- ▶ Typical disputes are mismatches between the accounts of the clearinghouse, and those of a broker.
These take around a week to clarify and settle.
- ▶ When there are large losses, disputes are settled by the exchange elders.

Settlement

- ▶ Contracts are physically settled at maturity.
In the recent past, all contracts were settled before maturity.
- ▶ For physical settlement,
 - ▶ the exchange receives an initial payment (around 15%-25% of the value) and contact details from the buyer;
 - ▶ The exchange contacts the seller with the buyer's details.
 - ▶ The settlement shifts to between the buyer and the seller.
 - ▶ The exchange comes in to resolve disputes on the quality of the delivered jaggery.

This was so troublesome that the exchange “encouraged” all traders to close their positions out before the contract matures.

Laws and regulation

- ▶ Laws governing exchanges are through regulatory Acts.
- ▶ Exchanges have an MOU with members, which is regulated by SEBI.
- ▶ The exchange is governed by a board with the following composition:
 - ▶ four members from the spot markets
 - ▶ six from the futures community
 - ▶ two “shareholders”
 - ▶ two “nominated by the board”
 - ▶ four nominated by the regulator

Other than the four nominated by the regulator, all the others are traders.

- ▶ The exchange has management staff of 18 people, eight of whom form the clearing house staff. None of the management are allowed to trade.
- ▶ Policy decisions are taken by various committees, which consists of members and brokers.

References

- ▶ Ajay Shah, Susan Thomas and Michael Gorham. *India's financial markets: An insider's guide to how the markets work*, Elsevier and IIT Stuart Center for Financial Markets Press, August 2008.
- ▶ Susan Thomas. *How the financial sector in India was reformed*. in: **Documenting Reforms: Case Studies from India**, (editor) S. Narayan. Observer Research Foundation, 2005.
- ▶ Debashish Basu and Sucheta Dalal. **The Scam: Who won, who lost, who got away**. Kensource, 2001
- ▶ Hendrik S. Houthakker and Peter J. Williamson. **The economics of financial markets**. Oxford University Press, 1996
- ▶ Robert C. Merton and Zvi Bodie. *A conceptual framework for analyzing the financial environment.*, in: **The Global Financial System: A Functional Perspective**, chapter 1, pages 3–32. Harvard Business School Books, 1995.