Market Microstructure

Traders@SMU

Agenda

- ❖ Brainteaser
- ❖ Core Microstructure Concepts
  - ○ Limit Order Books
  - ○ Liquidity
  - ○ Information Asymmetry
  - ○ Market Design
  - ○ Real World Examples

Brain Teaser of the Day

Based on a sample of 100 boxes (2 packs of 50) with a total of 10 defects, what is the probability that a third randomly selected pack of 50 boxes will contain exactly 5 defects?

Binomial: $\binom{n}{k}p^k(1-p)^{n-k}$

Poisson: $\frac{e^{-\lambda}\lambda^k}{k!}$

Geometric (Bernoulli): $(1-k)^{k-1}p$

Negative Binomial: $\frac{k-1}{r-1}p^r(1-p)^{k-r}$

Uniform: $\frac{1}{b-a}$

Answer

$$P(X = 5) = \frac{50!}{5!\,(50-5)!} * (.10)^5 * (1-.10)^{50-5}$$

$$n = 50$$

$$p = .10$$

$$k = 5$$

Foundation — Order Types & Limit Order Books

Key Topics:

Types
Market, Limit, Stop, Hidden /Iceberg Orders

LOB Mechanics
Bids, asks, spread, depth

Price—Time Priority
Fairness & Speed

Limit Order Books

- An electronic list that records all outstanding limit buy and sell orders for a specific security or commodity, organized by price level.
- It functions as a **central hub** where buyers and sellers submit orders specifying the **maximum price** they are willing to **pay** (for a buy limit order) or the **minimum price** they are willing to **accept** (for a sell limit order)

Limit Order Books

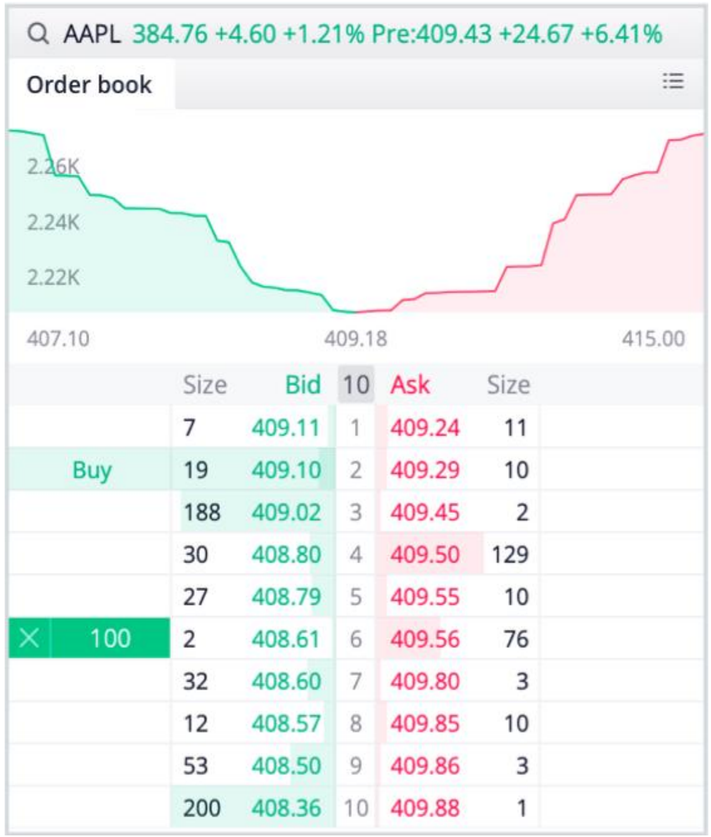
Two ways to View and Interpret LOBs

Real markets depend on this for matching flow.

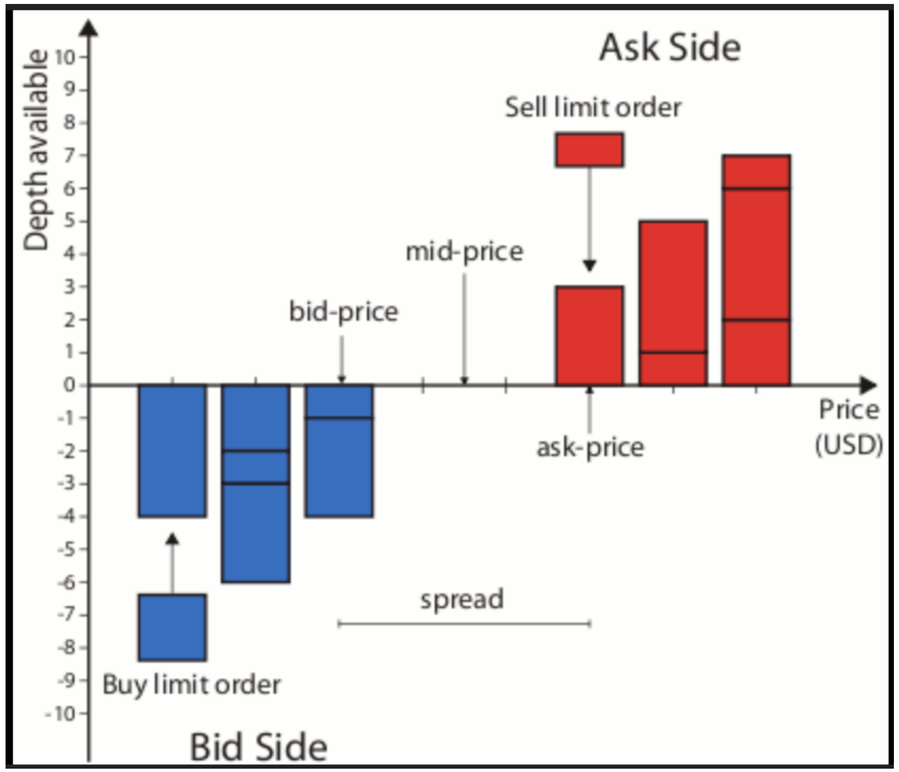
Example

- SPX Options Orderbook showing iceberg orders during CPI day.
  - What happens behind the scenes?

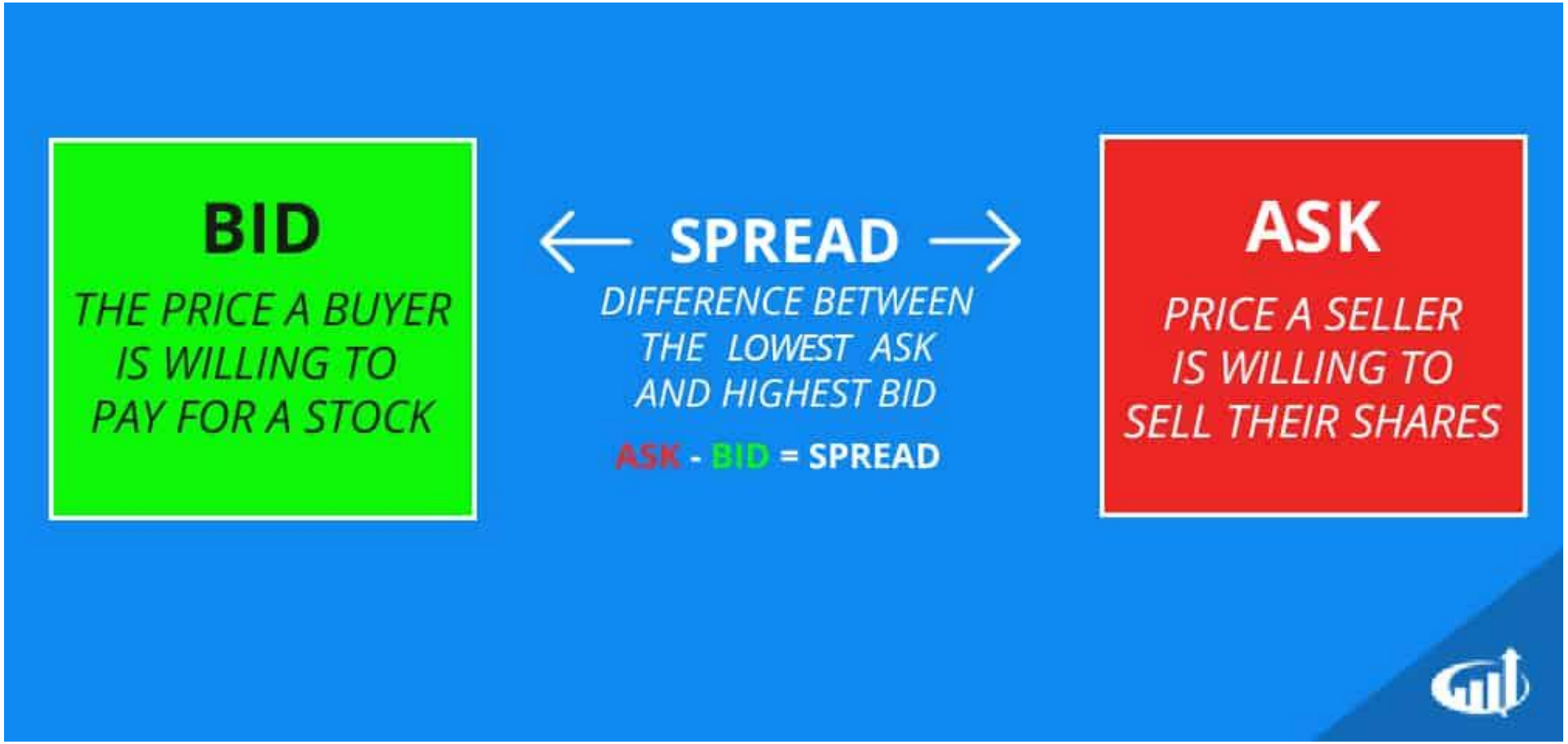
- Notice graph to the far right, how Buy limit orders sit on the tape waiting for price to dip and take out their size



	Size	Bid	10	Ask	Size
	7	409.11	1	409.24	11
Buy	19	409.10	2	409.29	10
	188	409.02	3	409.45	2
	30	408.80	4	409.50	129
	27	408.79	5	409.55	10
100	2	408.61	6	409.56	76
	32	408.60	7	409.80	3
	12	408.57	8	409.85	10
	53	408.50	9	409.86	3
	200	408.36	10	409.88	1



Liquidity & Transaction Costs



Liquidity & Transaction Costs

Key Topics:

What makes a market “liquid”? (tight, deep, resilient)

Costs

bid-ask spread, market impact, slippage, commissions

Kyle's Lambda

Quantifies how much price moves with order flow and assess market liquidity and transaction costs

Liquidity

The invisible cost traders always pay. Can think of it as Theta, or the cost you must pay, to play.

Example

Liquidity and Transaction Costs differ based on these factors

- Trade Size vs. Market Volume
- Time of Day
- Bid-Ask Spread
- Order Type & Market Impact
- Volatility & News Events
- Market Conditions

Information Asymmetry & Adverse Selection

Key Topics:

Roles played by Informed, Noise, and Market Makers

Asymmetric Information

In case of uneven distributions, MM widen spreads to limit exposure causing reducing liquidity

Real World Triggers

Earnings, Insider Information, Rumors, Leaks, Analyst Sentiment

Empirical Patterns

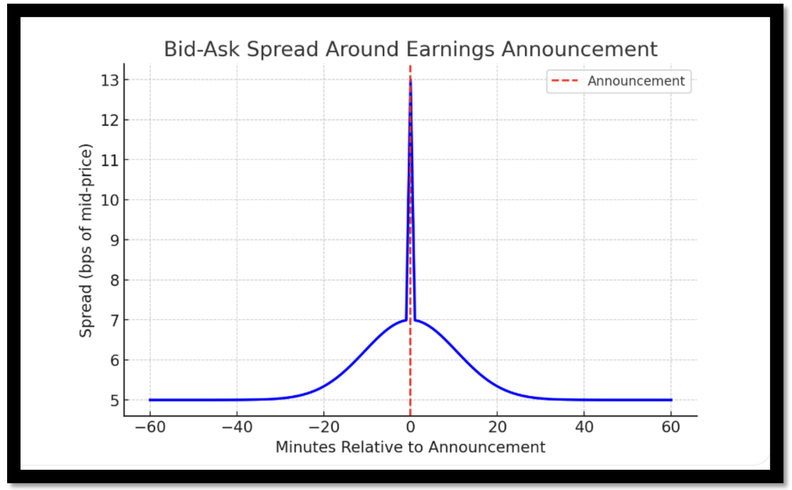
M&A Announcements, Macro Data Release, HFT's

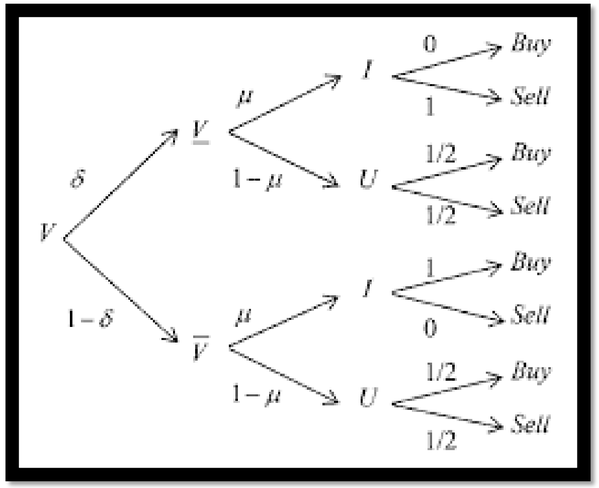
Rules and Regulations in NYSE vs NASDAQ

Market Model, Liquidity Providers, Trading Mechanism, Order Routing, Listing Standards

Glosten-Milgrom / Kyle Models

Utilizing game trees to formalize the flow of private information in the market. Nature behind proactive spreads, liquidity effects, and adverse selection.





Market Design & Trading Mechanisms

Key Topics:

Auction v. Cont. Trading

Auctions concentrate liquidity at a single point, Cont. trading spreads it throughout the day, which impacts price discovery and vol

Dark Pools (Off Exchanges)

Quantifies the price impact of trades and assess market liquidity and transaction costs

Index Rebalancing Days

Quarterly adjustments where stocks can be added or removed from an index, and weights adjusted

NASDAQ

NASDAQ uses a fully electronic limit order book, which allows for rapid matching of trades

- Impacts price discovery and volatility

NYSE

Trades can be matched electronically or facilitated by human designated market makers (DMM), depending on the order type and market conditions.

What happens when all of this breaks?

Fragility in Action – The Flash Crash

Key Topics:

Timeline

May 6th, 2010 — sudden plunge & recovery

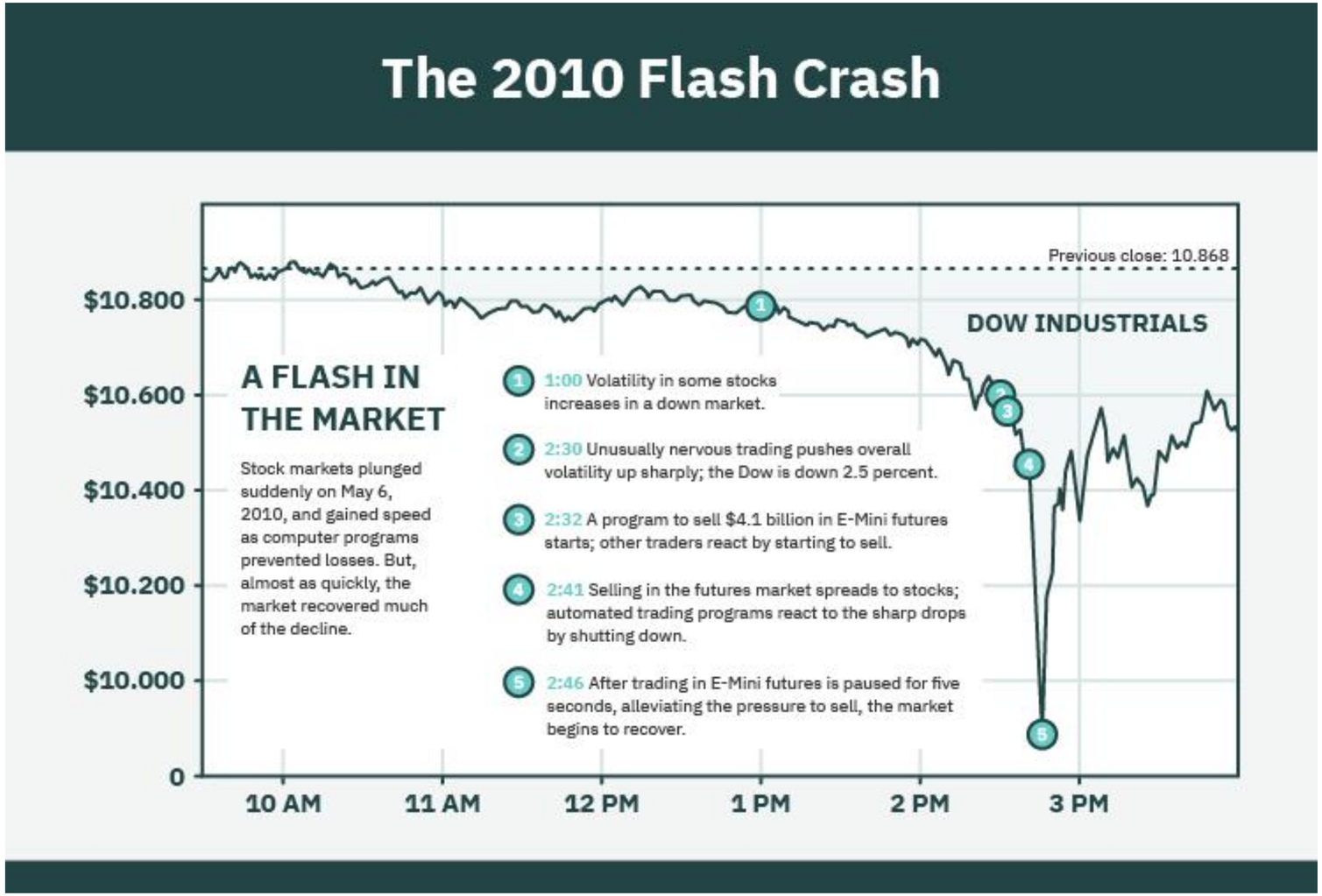
Chain Reaction

HFT withdraws, stops trigger, LOB thins out

Reforms

Circuit breakers, kill switches

Trigger Threshold: **7%, 13% and 20%** of prior days closing price

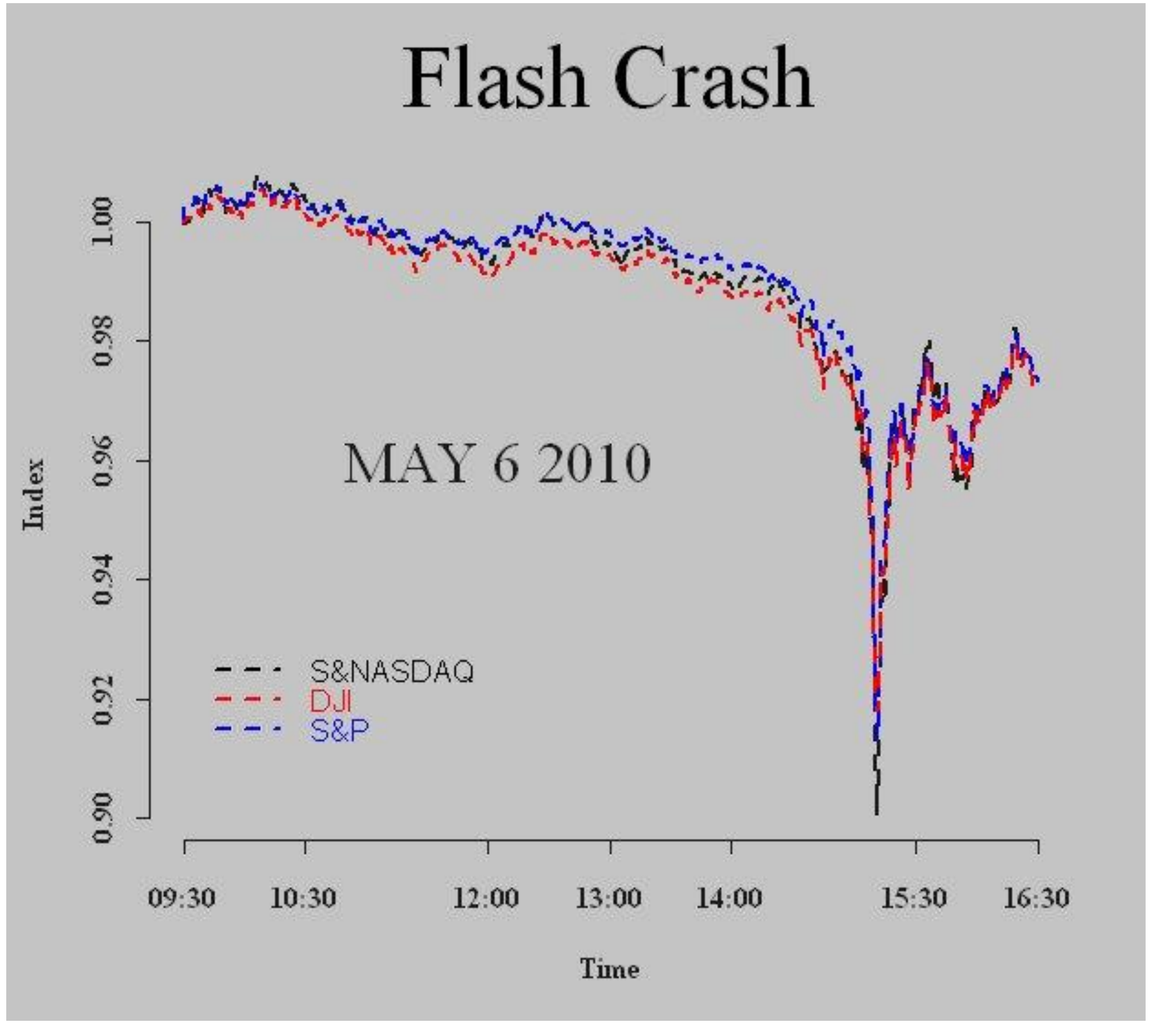


Fragility in Action — The Flash Crash

Drop in liquidity → **Feedback Loop**

Microstructure Failures Aren't Theoretical

- LOB Depth Vanished
- Liquidity Dried Up
- Info Asymmetry Surged
- Market Design was Stress-Tested



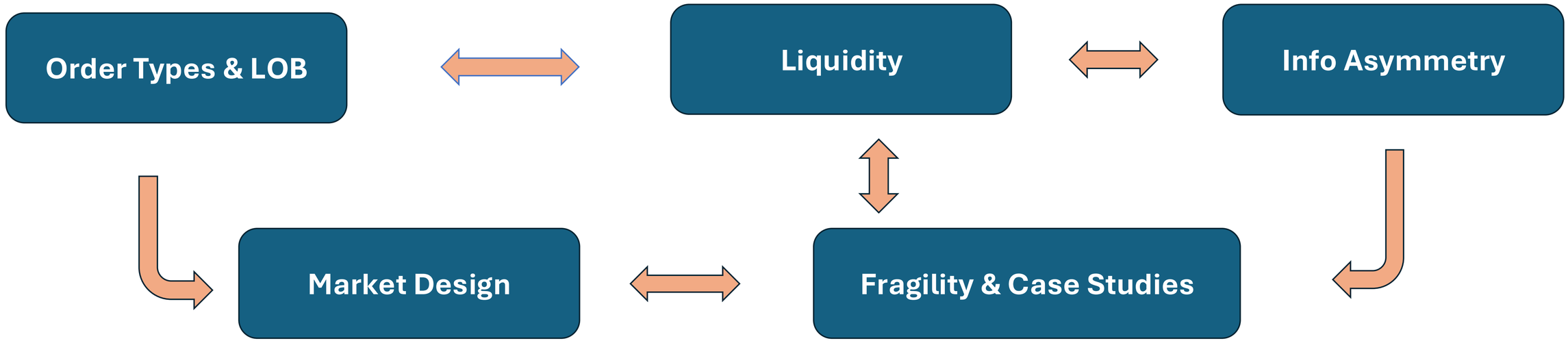
How it all Comes Together

Order Types & LOB
- The engine — defines how orders are placed, queued, and matched
- Core mechanic that supports everything else

Liquidity
- Structure of the Order book directly affects how liquid a market is
- Thin LOB? Slippage
- Deep Book? Tighter Fill

Info Asymmetry
- Liquidity and Info Asymmetry are in constant tug of war
- When a party has more insight than others — MM widen spreads

Market Design
- These rules of the NYSE and the NASDAQ govern how the LOB behaves, and how liquidity is accessed.



Why This Matters for Traders

Real-World Relevance

- Knowing **order types** lets you control execution.
- Understanding **liquidity** helps manage slippage & fills.
- **Info asymmetry** makes you smarter about when to trade.
- Knowing **design flaws** prepares you for **vol shocks**.
- **Case studies** show where edge or danger lies.

Terminology Actively Used on the Trading Floor

Axe: A view or conviction that you have about how they market or different components of that will realize
Fill: Get entered into a position
Size: How many lots you can get filled in
Best Way: Say you have a market, 10 and 15, you know that at worst case you'll get filled at 15. You tell the broker fill me best way to get an price hopefully less than 15 if he can offer it - but you are okay paying 15
My Size is Your Size: Fill me in the total quantity you have available. Thus you are axed to get into the position quantity wise
Color: Getting the information behind the product (who's trading it, what they're axe is)
Hit the bid: As a seller, you cross the bid ask spread to the buyers price so that you get filled and the transaction takes place immediately (Selling at the bid)

- This would happen if you have a bearish view and want to either close a long position, or enter into shorts but are willing to sell at bid because you foresee the price going down

Lift the Offer: If you are very axed to get into a position, you cross the bid ask spread and pay more to buy at the offer so that you're immediately filled (buy and the offer)

- This would happen if you have a bullish view and want to either close a short position, or enter into longs and you're willing to buy at the offer because you foresee the price going up

Lifted at X: You bought the security at X price
Unwind: To close a position, or unravel the vanilla structures that make up the synthetic position