Module 9 - Revision

MSc in Quantitative Finance (MQF)

Market Participants

Securities markets are marketplaces where assets are bought and sold between buyers and sellers:

- Sell sides (liquidity providers aka market makers)
  - Financial institutions
  - Brokers
  - Dealers
- Buy sides (liquidity takers)
  - Asset managers
  - Hedge funds
  - Treasuries
  - Retail investors

Securities Markets

There are many types of marketplaces, with different structures and trading mechanism such as accessibility criteria, governance/regulations, price setting, the kind of order types participants can place, matching rules etcs:

- Primary vs secondary markets
- Over-the-counter (OTC) markets vs streaming markets
- Manual vs electronic markets
- Dear vs quote-driven markets
- Auction markets (e.g. Singapore Bonds & Bills)
- Open-outcry markets (e.g. NYSE)

Limit order markets and Dealer Markets

Most trading mechanism can be viewed as a variation of these two main types, or a hybrid of both (e.g. LOB for liquid securities, dealers to support illiquid ones):

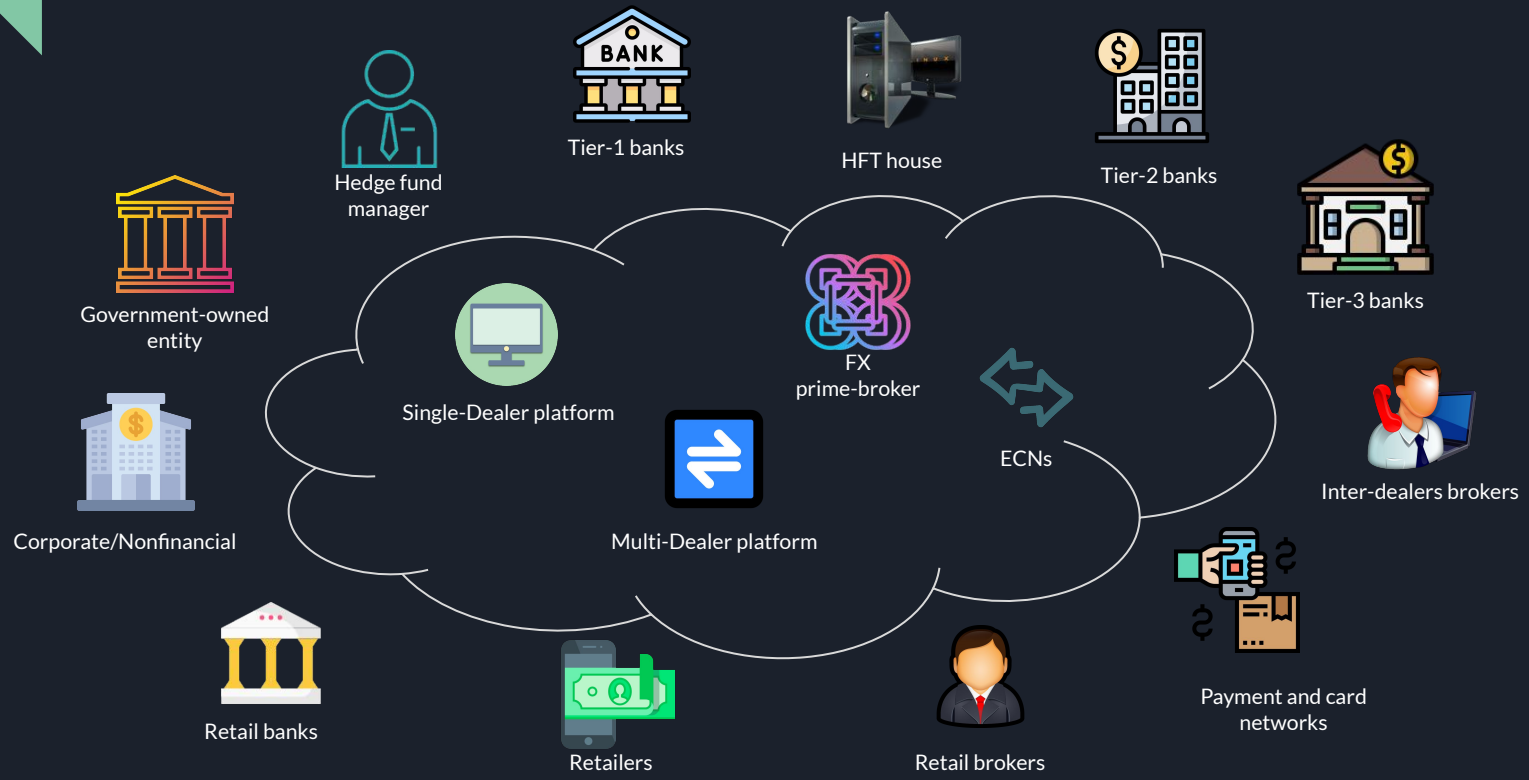
- In limit order market, market participants show their interests by submitting buy and sell orders. Bids (limit buy) and offers (limit sell) are aggregated into a central limit order book (CLOB), and a matching engine by the trading platform will match the orders between buyers and sellers (aka crossing).
- In a dealer market, a professional intermediary will quote offers and bids prices at which other participants can buy and sell from them. Dealers have no obligation to post a two-way quotes continuously, so brokers/investors may have to ask a few dealers to get the best prices. These are often the OTC markets.

Why Market Structure Matter

A transparent securities market is crucial for investors and firms to execute their portfolios, and to determine prices to guide capital allocations:

- Market structure plays a key role in determining market efficiency by reducing financial market frictions' costs
- A transparent structure will facilitate faster dissemination of price information (e.g. fast order book update), improving quality of price discovery (speed and accuracy)
- Participants will pay lower transaction cost (bid/ask spreads, trading fees) and is able to execute reliably throughout trading session without disruption
- Trading is governed by a set of rules, regulations and real-time monitoring that are open and aims at fostering competition, avoiding collusion that will hurt price formation
- Deep market liquidity that comes from many participants and resilient, allowing investor to trade large sizes quickly with minimal market impact
- Technologies, automation, ultra-fast algorithmic trading are key enablers in the evolution of market structure

FX Market Microstructure



Order Types

A trading exchange may supports a variety of order types to cater for different execution needs and degree of sophistication:

- Market order
- Limit order
- Stop-loss order
- Take-profit order
- Non-display orders (iceberg, hidden, peg etc.)
- Auction orders
- Execution algorithms - TWAP, VWAP, Iceberg

Central Limit Order Book

- Market makers provide liquidity by limit orders
  - Bids: Limit orders to buy at lower prices
  - Offers: Limit orders to sell at higher prices (aka ask prices)
- Takers consume liquidity by market orders (or aggressive limit):
  - “Lift offers”: Buy at higher ask prices
  - “Hit bids”: Sell at lower bid prices

Bids			Offers	
Bid Size	**Bid Price**	1.5	**Ask Price**	**Ask Size**
100	20.00		21.50	110
150	19.00		22.00	200
160	18.00		23.00	300

System Requirements

- Strategy type and data input requirements
- Trading frequency and real-time requirements
- PnL and risk management requirements
- User monitoring and controls requirements
- Deployment requirements (servers specification, network latency)
- Choice of programming languages
- Backtesting requirements
- Data capture requirements
- Post-trade requirements

Risk of Algorithmic Trading

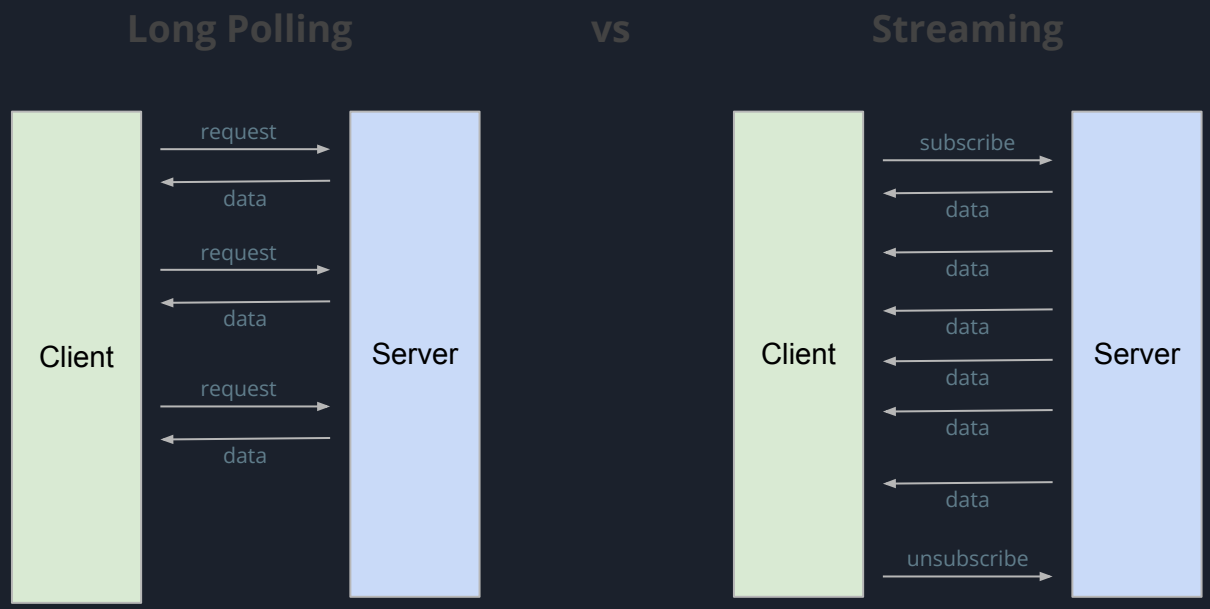
Algorithmic trading carries financial risks to its owner, as well as poses risk to stability of financial system:

- Technical issues (disconnection, server breakdown, power-cut)
- Errant algorithms a.k.a programming “bugs”
- Market risks - unexpected events, price fluctuations, and volatility
- Model risks - software and design flaws
- Market impact and amplification of systematic risk
- The flash crash, Knight Trading "Knightmare"

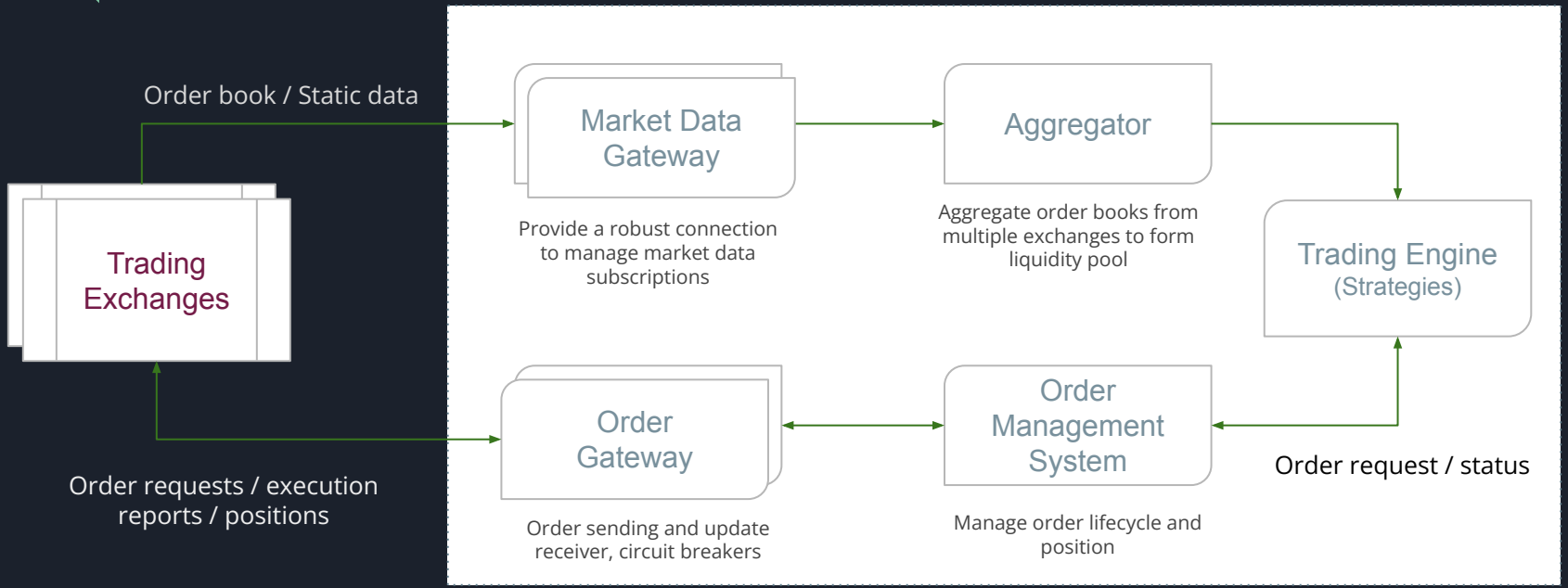
Preventive measures:

- Risk controls
- Circuit breakers
- Kill switches
- Pre-trade risk controls
- Speed bumps
- Active monitoring tools and alerting mechanisms

Polling vs Event-driven Processing



Market Data and Order Flow



Price Discovery Process

- Fundamental analysis by analysts
- Asset pricing by quantitative models
- Law of one price (no arbitrage) by algorithmic trading models
  - Pricing model to compute “fair mid”
  - Bid/ask spread adjustments
  - Mark or take orders to provide liquidity or to arbitrage away trading opportunities
  - Executions and risk updates
  - Incorporate new information to pricing model
- Ultimately, multiple counterparties selectively reveal information in exchange for information ultimately leading to a trade and new prices on order book