

High Frequency Trading (HFT)

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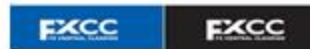
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KEY QUESTIONS

- What is high-frequency trading (HFT)?
- What is the economic contribution of HFT?
- Is HFT responsible for violations of market Integrity and/or for systemic risks?
- Is there a need for regulatory intervention?



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AGENDA



Hierarchy and definitions of terms



Algorithmic trading and High-frequency trading in detail



Economic assessment: Impact of HFT on market quality



Review of regulatory initiatives



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AT and HFT are Frequently mixed up in the public debate

Algorithmic Trading AT

The use of computer algorithms to **automatically** make certain trading decisions, submit orders, and manage those orders after submission.
(Hendershott and Riordan 2009)

High Frequency Trading

Subset of algorithmic trading where a **large number of small-in-size orders** are sent into the market at **high speed**, with round-trip execution times usually measured in milliseconds.
(Brogaard, 2010)

Ultra-HFT

Flash Trading

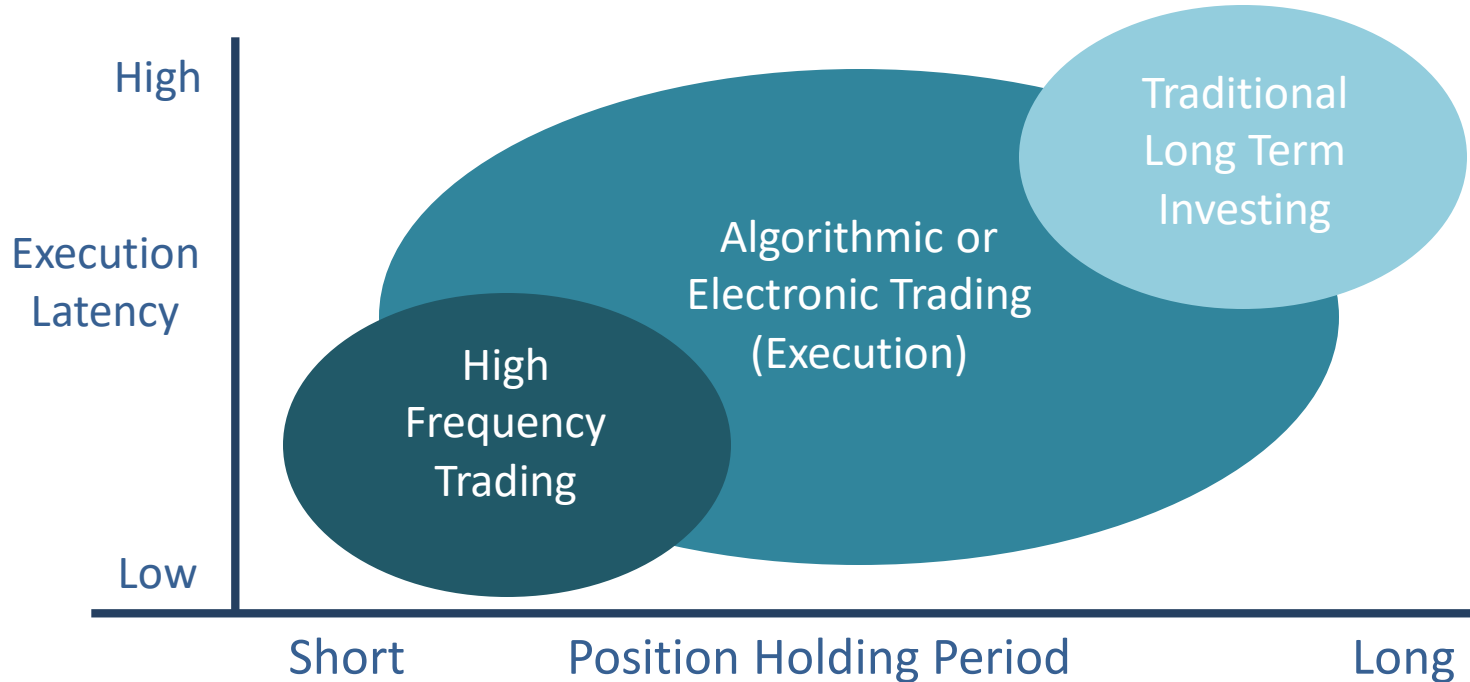
Subset of High-Frequency trading where a select group of trading firms, whom the exchanges allow to see orders a split second before the rest of the market, gain a significant advantage over other market participants



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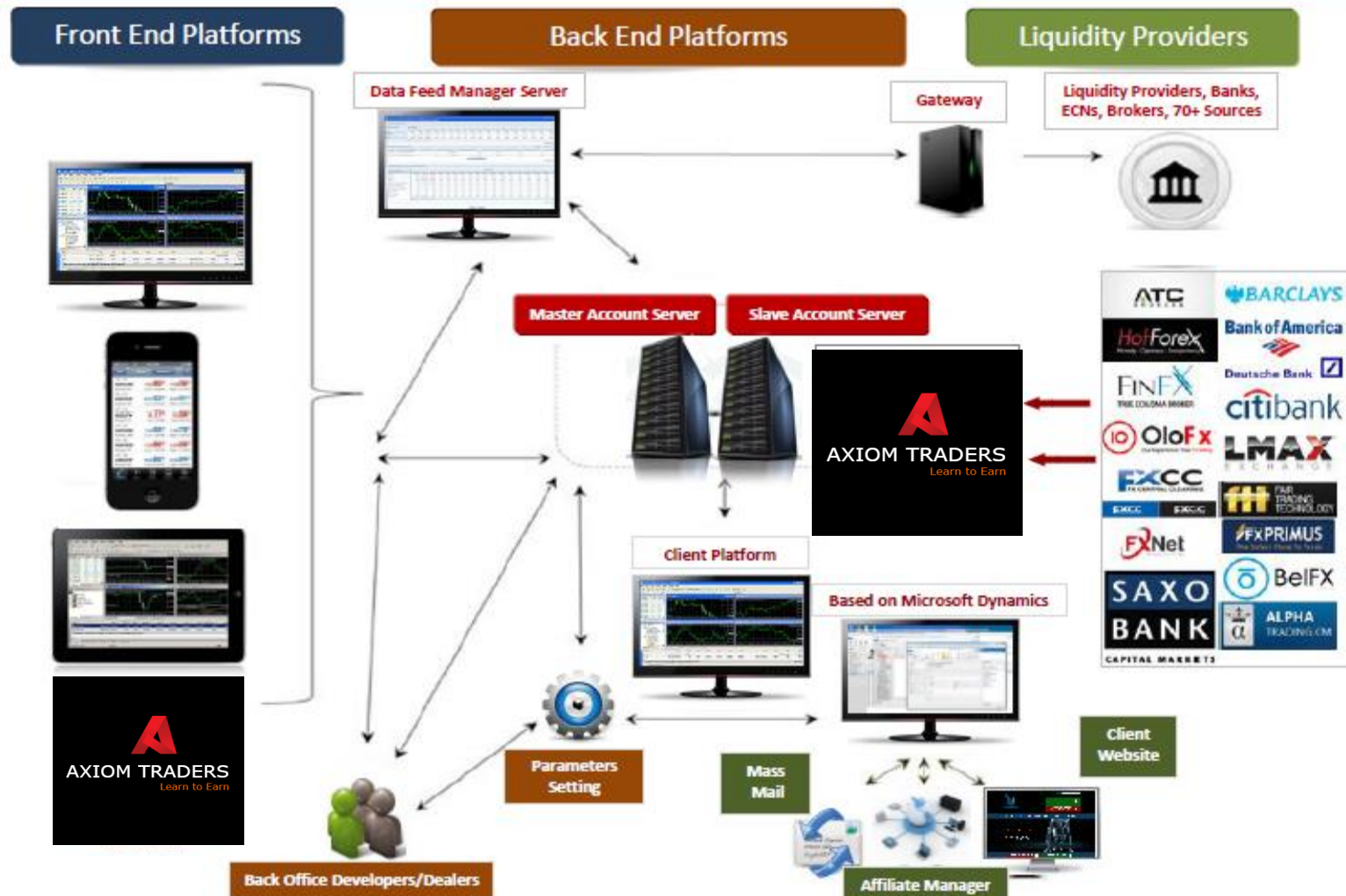
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HFT vs. AT and Traditional Long Term Investing



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HOW HIGH FREQUENCY TRADING WORKS – THE FRONT END – THE BACK END – AND THE LIQUIDITY PROVIDERS – CYCLE IS SHOWN BELOW



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ALGORITHMIC TRADING STRATEGIES

Name	Description of Strategy
Trade Execution Algorithms	Designed to minimize the price impact of executing trades of large volumes by 'shredding' orders into smaller parcels and slowly releasing these into the market releasing these into the market.
Strategy Implementation Algorithms	Designed to read real-time market data and formulate trading signals to be executed by trade execution algorithms. This may involve automatically rebalancing portfolios when certain pre-specified tolerance level are exceeded, searching for arbitrage opportunities, automatic quoting and hedging in a market maker type role, and producing trading signals from technical analysis.
Stealth/gaming algorithms	Designed to take advantage of the price movement caused when large trades are filled and also to large trades are filled, and also to detect and outperform other detect and outperform other algorithmic strategies.



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HIGH FREQUENCY TRADING STRATEGIES

Name	Description of Strategy
Electronic Market Making	Liquidity-Providing Strategies that mimic the traditional role market makers once played. These strategies involve making a two-sided market aiming at profiting by earning the bid-ask spread. This has evolved into what is known as Passive Rebate Arbitrage
Statistical Arbitrage	Traders look to correlate prices between securities and currencies in some way and trade off the imbalances in those correlations.
Liquidity Detection	Traders look to decipher whether there are large orders existing in a matching engine by sending out small orders (“pinging”) to look for where large orders might be resting. When a small order is filled quickly, there is likely to be a large order behind it.



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WHO ARE THE PLAYERS AND HOW DO THEY EARN MONEY?

Large-scale turnover of numerous positions with a small return on each turnover

- HFTs are mainly proprietary traders (own-account); HFT is usually not conducted on an agency basis (for-clients)
- Segmentation of professional HFT Firm: proprietary trading firms (48%), proprietary trading desk of a multi-service broker-dealer (46%), or hedge funds (6%)
- All asset classes involved, extending from equities and derivatives into currencies and fixed income.
- Volume of HFT: No consistent figures on the size of HFT available (Estimations: 60-70% trading US trading volume and 40% in Europe.
- Prominent Players: Proprietary trading firms Getco, Optiver or Tradebot, hedge funds Citadel or Renaissance Technologies, and trading desks within multi-service market participants, e.g. at Goldman Sachs or Citigroup



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CHARACTERISTICS OFTEN ATTRIBUTED TO PROPRIETARY HFT FIRMS

The need for Speed is paramount

- High-speed and sophisticated quantitative and algorithmic computer programs for generating, routing, and executing orders.
- Real-Time Data.
- Very short time-frames for establishing and liquidating positions.
- Very large number of trades generated on a daily basis, of which often > 80% are cancelled shortly after submission.
- ➔ Ending the trading day flat (“delta-neutral”), i.e. without carrying significant, un-hedged positions over-night.
- ➔ Speed matters in the absolute sense of achieving very small latencies, but even more so in the relative sense of being faster than competitors, even if only by a microsecond.
- ➔ Usage of co-location / proximity services to minimize latency.



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IMPACT OF HFT ON LIQUIDITY

Provision of Liquidity and Linkage of Fragmented Markets

- Often read argument: HFTs provide no real liquidity because they are constantly attempting to flatten their position.
- Empirical evidence, however, suggests that.....
 - HFTs reduces spreads
 - HFTs add substantial liquidity to the market
 - HFTs alleviate effects of market fragmentation.
- From the academic side, there is no proof for a negative liquidity impact, but some issues still remain.....
 - No market making obligation: HFTs are not obliged to provide liquidity.
 - Size of Quotes: HFTs do not contribute to market depth.
 - Accessibility: HFTs quotes may be added and cancelled in milliseconds



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IMPACT OF HFT ON PRICE DISCOVERY PROCESS

HFT is Widely seen as Beneficial

- HFTs tend to follow a price reversal strategy, driven by order imbalances, and so tend to stabilize prices.
- HFTs provide the best bid and offer quotes for a significant portion of the trading day (but only around a quarter of the book depth).
- Algorithmic traders' quotes play a larger role in the price formation process than human quotes.



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IMPACT OF HFT ON PRICE DISCOVERY PROCESS

HFT is Widely seen as Beneficial

NO PROOF FOR A NEGATIVE IMPACT ON THE PRICE DISCOVERY PROCESS:

- On the one hand, price discovery benefits from market participants who quickly detect anomalies in market prices and correct them.
- On the other hand, HFT may also be distorting price formation if it creates an incentive for natural liquidity to shift into dark pools as a way of avoiding transacting with ever-decreasing order sizes. But: no documented empirical evidence so far to support the possibility of this distortion.



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THE INVESTOR PERSPECTIVE

Issues of Fairness and Investor Protection

- Electronification of trading originally led to a democratization of exchange trading: retail investors benefitted from equally quick access to markets as professionals.
- However, special arrangements to cater for the needs of HFT (i.e. proximity and co-location services to reduce latency, special trade data feeds) give preference to those traders preference to those traders possibly harms long - term investors and market term investors and market quality.
- (Sub-penny) Arbitrage, where ATs and HFTs buy and sell stock purely to collect rebates, is often criticized as bringing no value to the retail / long-term investor. But: This provides liquidity (“artificial volume creation”) that would otherwise not be available, easing the pressure of supply and demand.
- Spreads that have been narrowed (and are kept narrow) by HFTs benefit both retail and institutional investors.



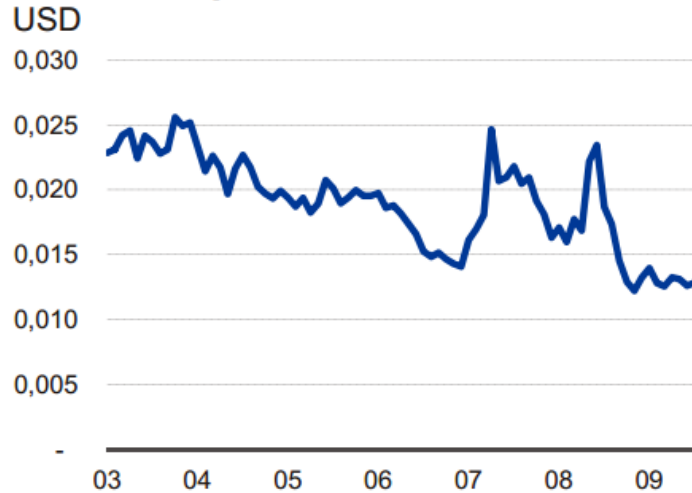
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THE INVESTOR PRESPECTIVE

Issues of Fairness and Investor Protection

Bid-Ask Spread Reduction



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REGULATORS' CONCERN

Risks for market integrity / confidence and systemic stability

- Market integrity could be endangered when technological advantage is misused for abusive tactics (e.g., by manipulating the price discovery process through excessive order entries and/or cancellations).
- Financial markets could become exposed to systemic risks as a result of technical vulnerability (malfunctioning algorithms), self-reinforcing strategies, and/or overload of technical systems and/or overload of technical systems.
- Numerous regulatory investigations and initiatives are under way:
 - SEC/CFTC: (Interim) SEC/CFTC: (Interim) "Market Event Report Market Event Report".
 - Netherlands Authority for the Financial Markets (AFM): HFT Report.
 - European Commission: Consultation to MiFID-Review.
 - ESMA: Consultation announced (summer 2011).
 - Working Groups at IOSCO, FSB, BIS, ...



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HOW TO GURANTEE INTEGRITY AND MAINTAIN STABILITY?

Effectiveness of proposals put forward so far is unclear

- Some proposals are conducive to the regulators' objectives:
 - Risks controls (circuit breakers) to be adopted by trading venues provided they are properly calibrated in cooperation with market participants and consistent across venues.
 - Adoption of minimum tick sizes, calibrated by reference to price and levels of liquidity.
 - Co-location facilities to be made available on a non-discriminatory basis.
- Others are unrealistic and/or will be difficult to put into practice:
 - Artificially limiting execution speed on trading venues.
 - Imposing affirmative obligations (enforced market maker role)
 - Minimum life-time for quotes before they can be cancelled or modified.
- Regulations should not impair HFT's liquidity provision nor push HFT to other jurisdictions or OTC.



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