High-Frequency Trading: Risks and Benefits

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Microwaves & Lasers in Financial Trading

- Transatlantic fibre-optic cables
  US - Europe - Asia
- Microwaves Chicago - NY & London - Frankfurt
- Laser network NYSE - NASDAQ

Current microwave data latencies:
- London - New York: 31 ms
- London - Frankfurt: 2 ms
- Chicago - New York: 4 ms

(Source: http://www.quincy-data.com/)
What is High-Frequency Trading?

Automated trading that employs

▶ algorithms for order execution and routing
▶ low-latency technology & co-location services
▶ high message rates

Carried out by (i) proprietary firms, (ii) broker-dealer proprietary desks, (iii) hedge funds.

Features:

▶ Very short holding periods
▶ No significant over-night positions
▶ Very low margins per trade
▶ Focus on highly liquid instruments
HFT Strategy Liquidity Provision / Market Making

- Earning the Bid-Ask Spread
- Liquidity rebate trading
HFT Strategy Order Detection

- "Pinging" for hidden liquidity
- Order anticipation in dark pools
HFT Strategy Statistical Arbitrage

- Market neutral arbitrage
- Cross-market strategies
- ETF arbitrage

Other HFT Strategies

- Latency arbitrage
- "Sniffing out" (routed) order flow / front running
- Momentum ignition
- Spoofing (illegal)
- ...

Spoofing or Quote Stuffing?

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- AMD - NASDAQ Trading - 29 Sept 2011 - 14:08:25

- Total of ~ 110’000 quotes submitted within 18 sec. (~ 53% of entire day)

- Only 20 executions, rest canceled

- Average duration between submissions 1/10 ms

- Submission pattern not random. Algorithm draws pattern into posted volume
Extent of HFT

Share of HFT in equity trading (in %)

- Similar developments in U.S. futures trading
- Approx. 40% in Bund futures trading in 2014/15
- Approx. 40% HFT in spot FX trading as at 2014

Sources: TABB Group, Deutsche Bank Research
Arguments on HFT

▶ Michael Lewis ("Flash Boys"): Speed traders prey on retail investors

  ▶ HFT steals information rents
  ▶ Markets are too active and too volatile
  ▶ No social value & degrades market function ⇒ Negative-sum game

▶ Paul Krugman (NYT, 2014)
  ▶ ”It’s the whole financial industry, not just that piece [HFT], that’s undermining our economy and our society”.
  ▶ No return for investment into speed.

▶ Burton Malkiel (FT, 2009):
  ▶ High-frequency trading is a natural part of market evolution
  ▶ Technology has dramatically improved the efficiency of markets.
History of HFT

- Introduction of ECNs in the 1990s
- 1998: SEC passed Reg. ATS ⇒ Increase of market fragmentation
- 2001: Quoting prices in decimals ⇒ reducing spreads
- 2005: SEC passed Reg. NMS; orders posted nationally (NBBA, NBBO); "trade-through rule"

- In Europe, MiFID introduces principles-based best execution ⇒ Smart Order Routing (SOR)
- 2007: Direkt market access (DMA); flexible fee structures
- Co-location and proximity services

⇒ Regulation established level playing field for HFT!
Some Evidence from Recent Research

▶ Hasbrouck & Saar (2013): Increased low-latency activity decreases spreads, increases displayed depth and lowers short-term volatility.
▶ Menkveld (2013): HFTs serve as high-frequency market makers.
Evidence: HFT in EUREX Bund Futures Trading

- Hautsch, Noé, Zhang (2017)

- Proprietary order-level message data with member ID and trader ID
  ⇒ Institutional HFT identification

- Time stamps 1/10 microsecond.

- Statistical HFT Identification:
  - > 1,000 order submissions per day
  - End-of-day position less then 5% of daily traded contracts
  - Minimal order life times and time between order submissions

- 120-min periods around scheduled news announcements; 2014-2015
HFT Liquidity Supply & Demand Participation Rates

- Generally: liquidity provision > 50%; liquidity demand < 25%
- BUT: Before news release, HFT liquidity supply drops by 60%!
Ratio of HFT-Spread to nHFT-spread

- Generally, HFTs post more narrow spreads than non-HFTs
- BUT: Shortly before news release, HFT spreads increase by 25%!
(Gross) Profit & Loss Analysis

- On average, HFTs earn ca. 100k Euro per hour around news arrivals
Positioning Profits & Net Spreads

- HFTs make profits by market making.
- On average, no profits through directional trading!
HFT Liquidity Demand at Day after Brexit (24/6/16)

- High order aggressiveness: HFTs initiate more than 60% of all trades
HFT P&L after Brexit (24/6/16)

- HFTs earn approx. 4 Mio Euro through directional trading
- No "classical" market making!
Good or Bad?

- Passive HFT strategies are beneficial for markets.
- But: HFTs are no designated market makers. Change strategies according to situation. Run mixed strategies.

**Unclear:**
- Effect on volatility and market stability in extreme situations?
- Higher risk of tail events?
- Higher frequency of ”(mini) flash crashes”? ⇒ Research needed!

**Most difficult:**
- Social benefit of HFT (liquidity supply)? Can we ever answer this ..?
Future of HFT

- Extent of HFT will decline
  - Increasing costs of infrastructure
  - Increasing competition
  - Alternative trading systems (dark pools, "speed bumps")
  - Stronger regulation

But:
- HFT will remain integral part of electronic trading!
- HFT will change its form depending on (uncertain) regulation
Regulatory Uncertainty

Regulatory Initiatives US

- 2010: SEC introduced trading pause regulation
- 2010: Dodd-Frank restricts so-called proprietary trading of banks
- 2010: SEC bans "naked" (unfiltered) market access
- 2015: SEC forces certain HFT broker-dealers to register with FINRA
- 2015: CFTC proposals for Regulation Automated Trading (Reg AT)
- 2015: SEC approves batch-auction platform in Chicago

MiFID II in Europe (as at 2018)

- Obligations on disclosure of information, recording, and monitoring
- Obligations for trading venues on monitoring, capacity, control mechanisms and transparency
- Obligations for firms pursuing market making strategies
Potential Regulatory Pitfalls

- (Too?) much focus on monitoring, registration and (massive) data collection

- Details on risk control & testing of algorithms (e.g., MiFID II) vague. Not clear how to implement.

- Regulation too rigid for HFT market making (e.g., MiFID II)

- No attempts to limit market fragmentation in the U.S.

⇒ Need more attempts to mitigate risks while preserving benefits!
Two Negative Scenarios

Too rigid and misguided regulation:

- HFT will be reduced
- Market quality will suffer: lower liquidity; higher transaction costs; increase of volatility
- Liquidity flees into non-regulated markets
- Still high regulation costs

Insufficient regulation:

- Extent of HFT will increase
- Higher risk of flash crashes; lower market stability and quality
- High costs for monitoring and investigating market manipulation
A (More) Positive Scenario

Technological innovation hand in hand with smart regulation

- Stopping arms race for speed & predatory trading
  - Limiting latency differences (e.g. as on IEX; ICAP’s EBS)
  - HF batch auctions ⇒ Implications for liquidity supply unclear
- More incentives for high-frequency market making
- More incentives for smarter but not faster algorithms
- Well-balanced use of ”circuit breakers” and general safeguards

⇒ HFT will settle down to a moderate level and will predominantly perform market making