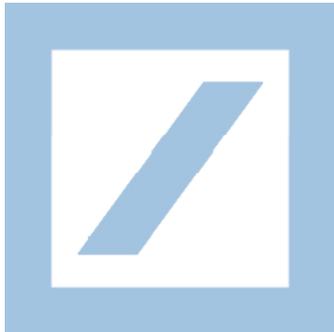


# High-frequency trading

Better than its reputation?

Berlin, 8. März 2011



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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?**



# Agenda

**1**

**Hierarchy and definitions of terms**

**2**

**Algorithmic trading and High-frequency trading in detail**

**3**

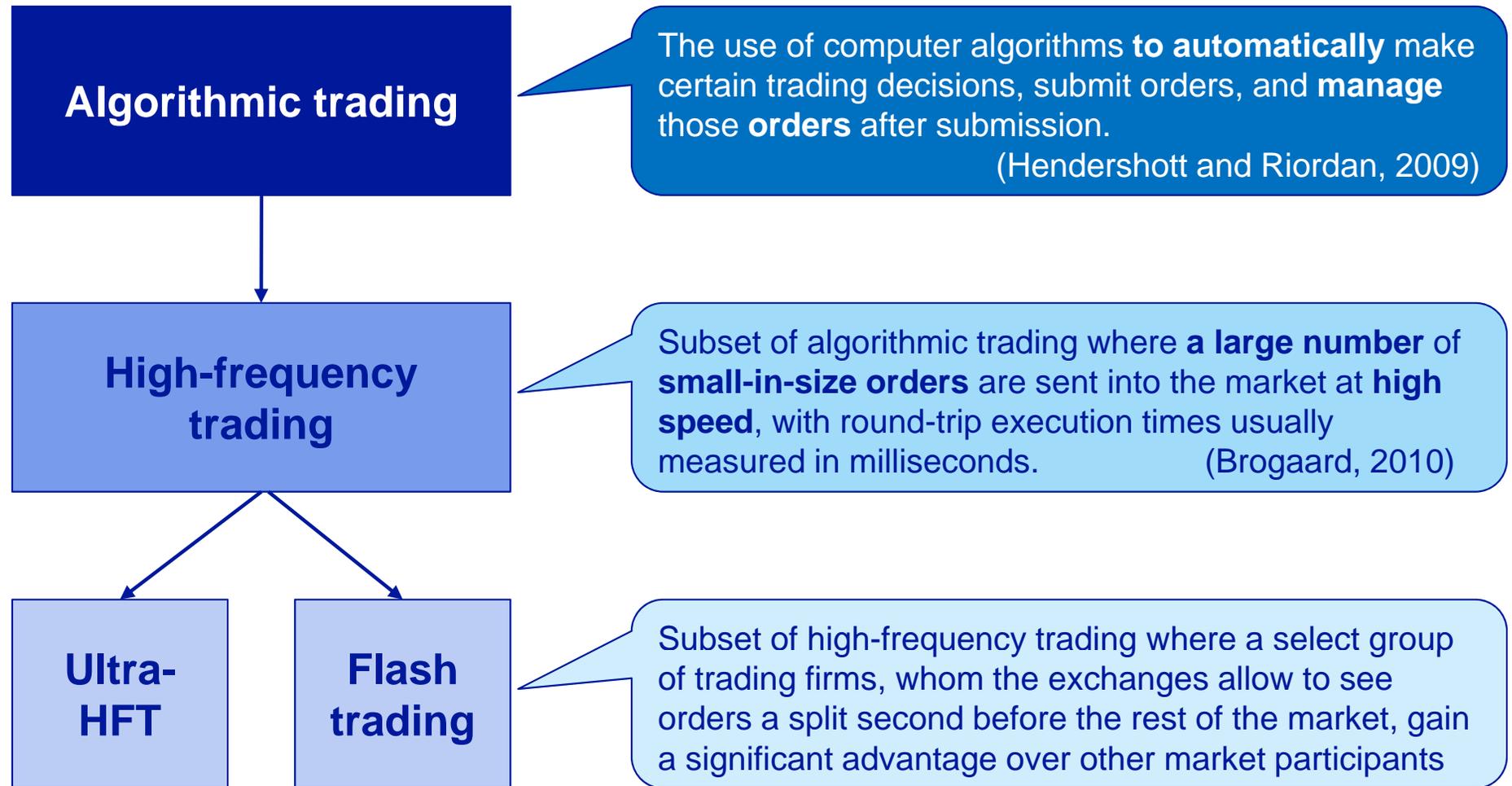
**Economic assessment: Impact of HFT on market quality**

**4**

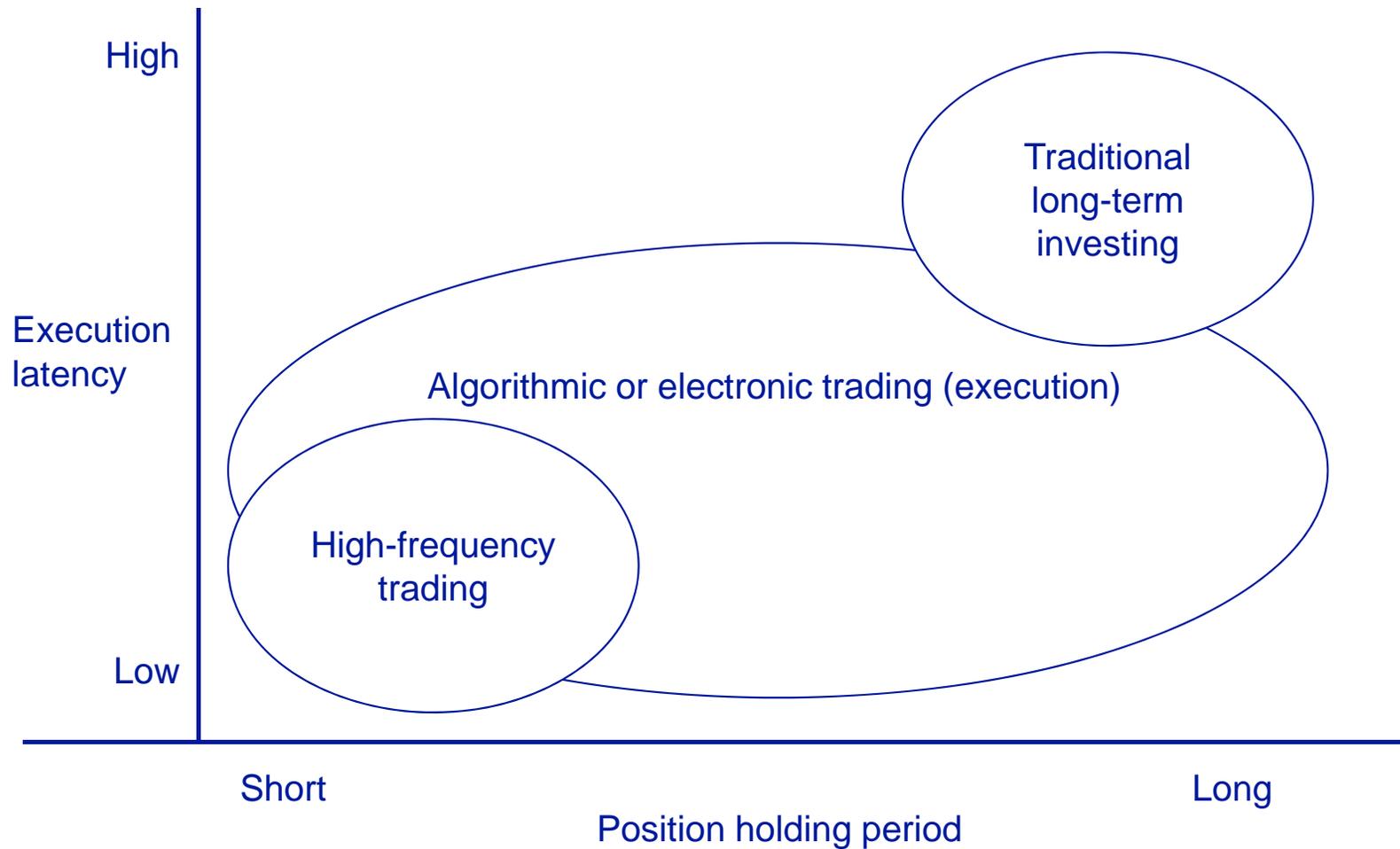
**Review of regulatory initiatives**



# AT and HFT are frequently mixed up in the public debate



# HFT vs. AT and traditional long-term investing



Source: Aldridge 2010



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## Algorithmic trading strategies

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

Source: ASIC 2010



## High-frequency trading strategies

Name	Description of strategy
<b>Electronic market making</b>	<b>Liquidity-providing strategies</b> that mimic the traditional role market makers once played. These strategies involve making a two-sided market aiming at <b>profiting by earning the bid-ask spread</b> . This has evolved into what is known as Passive Rebate Arbitrage.
<b>Statistical arbitrage</b>	Traders look to correlate prices between securities in some way and trade off of the <b>imbalances in those correlations</b> .
<b>Liquidity detection</b>	Traders look to <b>decipher whether there are large orders</b> 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.

Source: Aldridge 2010



## 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-client).
- Segmentation of professional HFT firms: proprietary trading firms (ca. 48%), proprietary trading desk of a multi-service broker-dealer (ca. 46%), or hedge funds (ca. 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% of US trading volume, ca. 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.



## 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 analysis.
- 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, unhedged 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 minimise 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 reduce 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: HFT quotes may be added and cancelled in milliseconds.



## Impact of HFT on the 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 stabilise 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.

### → 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.



## The investor perspective

### Issues of fairness and investor protection

- Electronification of trading originally led to a democratisation 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 → possibly harms long-term investors and market quality.
- (Sub-penny) Arbitrage, where ATs and HFTs buy and sell stock purely to collect rebates, is often criticised 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.



## The investor perspective

### Issues of fairness and investor protection

#### Bid-Ask Spread Reduction

USD



Source: Georgetown University, 2011



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## Regulators' concerns

### 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.
- Numerous regulatory investigations and initiatives are under way:
  - SEC/CFTC: (Interim) “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, ...



## How to guarantee integrity and maintain stability?

Effectiveness of proposals put forward so far is unclear

- Some proposals are conducive to the regulators' objectives:
  - Risk 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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