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# AT/HFT and market quality: reconciling the evidence

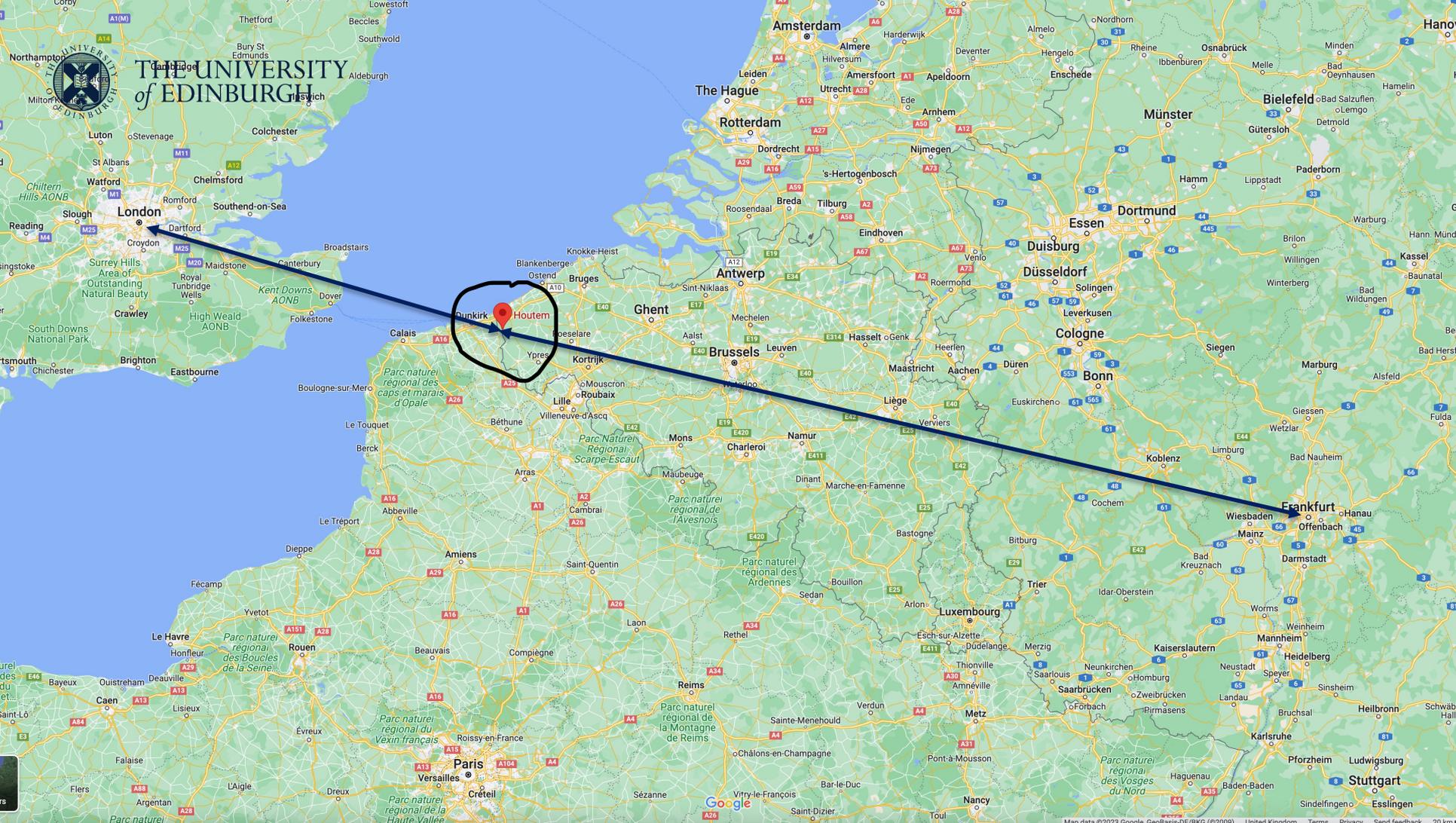
Gbenga Ibikunle

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## A few key observations from Chapter 4 of the Foresight report

- Addresses CBT broadly, but focuses on HFT as the driver of effects credited to CBT
- Focuses on the effects of HFT on (price) volatility
- CBT/HFT-volatility (financial instability) relationship is likely driven by:
  - **Feedback loops** (e.g., risk, volume, news, delay, shallowness, index etc.)
  - **Socio-technical factors:** normalisation of deviance
- A couple of statements that time appear to have proven ‘wrong’:
  - *“HFT may have reached its equilibrium penetration in London and EuroNext equity trading”*
  - *“Reports (based on a 2010 report) suggest that profits of HFT companies have declined”*



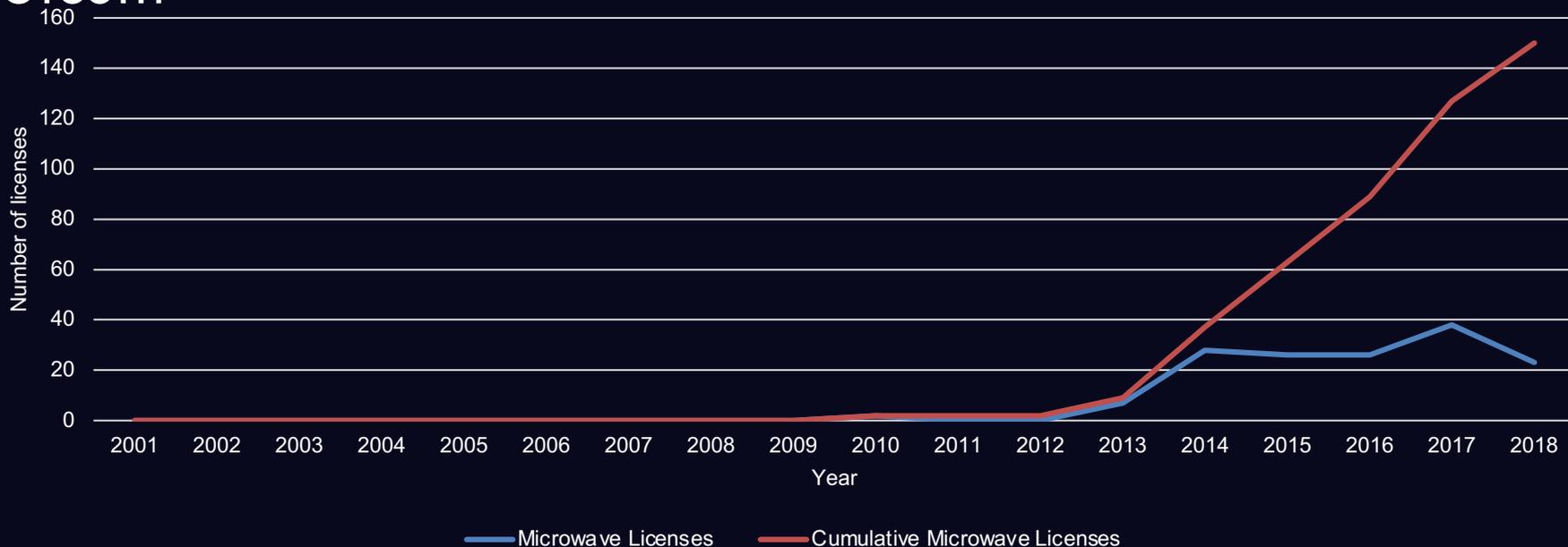
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Houtem



# MW networks licenses obtained by HFT-linked companies from Ofcom





## The (conflicting) effect(s) of AT/HFT (today)?

- Still an ‘unresolved’ and continuing line of academic research, but responsible for an upsurge in latency arbitrage activity...
  - LA results in ~\$5 billion in losses/year in global equity markets (Aquilina et al., 2022)
- Effects appear to depend on whether AT/HFTs provide liquidity with limit orders or take liquidity with market orders
  - A latency arbitrage algo using market orders imposes adverse selection risk on others (Biais et al., 2015; Foucault et al., 2016; Weller, 2018)
  - An endogenous HF liquidity provider becoming faster than other market participants, faces lower ‘picking off’ (adverse selection) risk and could increase liquidity (Hendershott et al., 2011; Brogaard et al., 2014; Hoffmann, 2014)

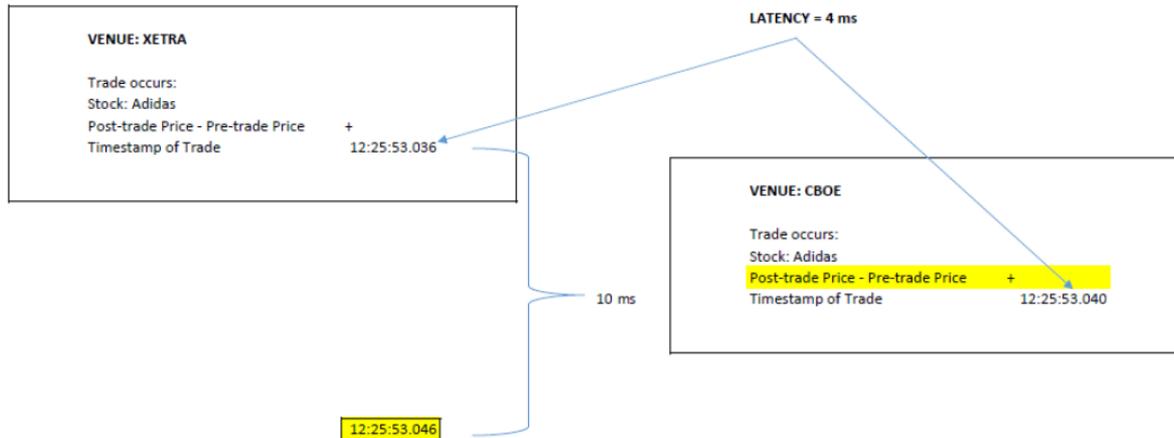


## The effects of AT/HFT (today)?

- Effects also depend on the type of LA opportunities being exploited by HFTs:
  - Toxic (asynchronous price adjustments linked to information)
  - Non-toxic (linked to temporary liquidity shocks)
- **Reconciling the evidence using European data:** HFT is deployed to either avoid adverse selection or impose it on slower traders, the conflicting (aggregate/market-wide) effects of HFT in a market context could be explained by:
  - Whether the dominant traders are endogenous liquidity providers or aggressive snipers, and...
  - the nature of the toxicity or otherwise of the LAOs that HFTs exploit

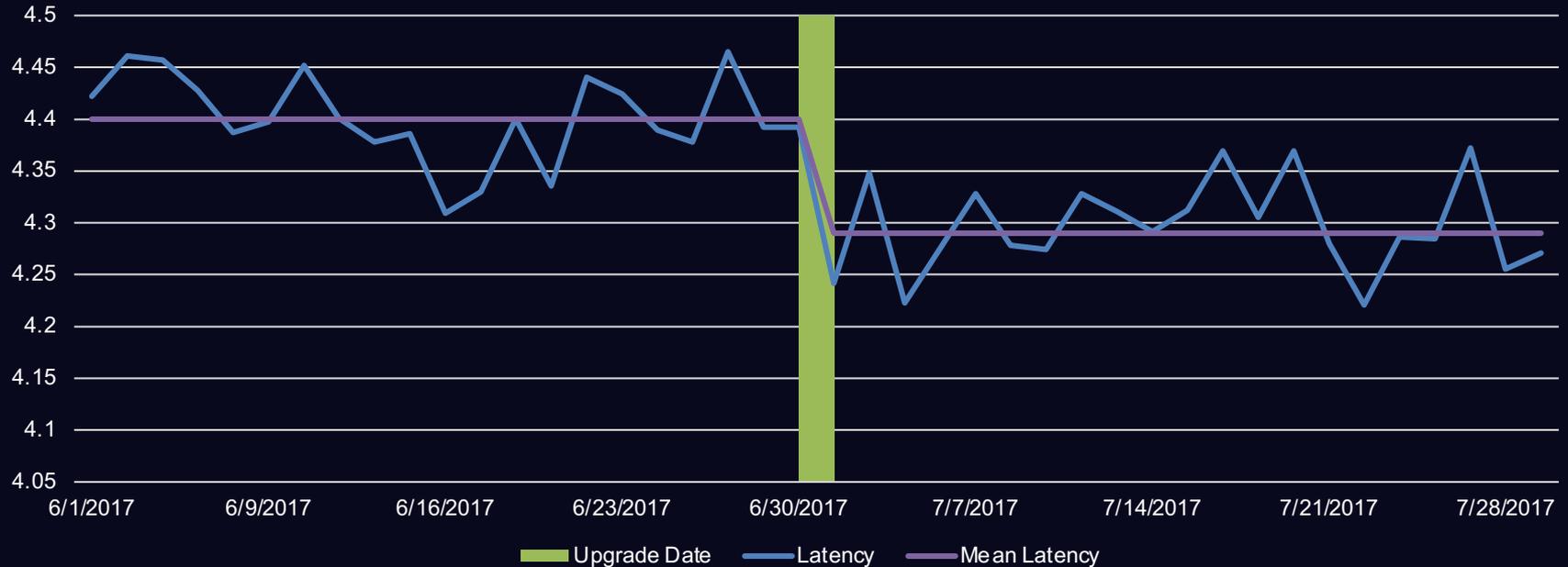
## Evidence from Frankfurt-London microwave networks

- For the largest 100 German stocks, we compute information transmission latency (TL) between a ‘home exchange’ in Frankfurt (Xetra Stock Exchange: XSE) and a ‘satellite exchange’ in London (Cboe Stock Exchange: CBOE)... in both directions





# TL and speed-inducing tech upgrades





# Evidence from Frankfurt-London microwave networks

- To account for endogeneity given TL's nature, we implement a 2SLS IV framework:
  - Latency-impacting technological upgrades implemented by XSE
  - Longitudinal data capturing the introduction of new microwave connections
  - In the spirit of Hasbrouck and Saar (2013), the average TL in stock size groups
- Adapt Foucault et al. (2017) to identify toxic and non-toxic LAOs
- We test the effects of latency following LAOs on:
  - Liquidity (spread measures)
  - Price discovery (decomposed into public and private information based on a modified microstructure VAR – Hasbrouck, 1991, 1995; Barclay and Hendershott, 2003)



## Evidence from Frankfurt-London microwave networks

- Prices in London largely respond to price changes in Frankfurt within 3 (5ms) 49% (80%)
    - **Mackay Brothers:** average MW latency between the XSE (FR2) and CBOE (LD4) data centres = 2.3ms
    - **Perseus:** round-trip latencies = 4.6ms and 8.4ms for MW and fibre optics respectively
  - March 2017–August 2018: ~**1.93M LAOs**; 677,328 (35.15%) are toxic – mostly on ‘news days’
  - When HFTs exploit toxic LAOs, they:
    - Impair liquidity: 1ms increase in TL = 18.5% (17%) increase in effective (quoted) spread
    - Enhance price discovery by facilitating incorporation of information in prices: 1ms increase in latency reduces public (private) information components of price discovery by 10.79% (7.83%)
  - When HFTs exploit non-toxic LAOs, they:
    - Enhance liquidity/reduce transaction costs  incentivise information acquisition
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Thank you

