

Discussion: The Cost of Latency

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Objectives and Latency Cost

- Paper develops optimal control problem for quote updating.
- Considers *latency* = time from order submission to trade.
- Minimizes expected cost using $P(\text{trade in } \Delta t | \text{quote})$.
- Solves DP w/assumptions to get an approximate solution.
 - ① Yields optimal limit price for *trading* horizon;
 - ② Closed-form in asset price process parameters $\delta, \sigma, \Delta t$;
- Then matches this with an empirical analysis to see:
 - ① Latency costs for GS stock with varying trade horizons;
 - ② Latency costs for NYSE stocks, GS from 1995–2010; and,
 - ③ Implied latencies for NYSE stocks, GS from 1995–2010.
- Finds latency costs = $O(\text{commissions})$, *i.e.* non-ignorable.

Connections/Extensions

- Note another driver of low latency: “best execution.”
- Should explore implications for search costs wrt latency.
 - Implications about allocative efficiency, investor welfare?
- Note you provide *reverse* sequential trader perspective.
 - *vis-a-vis* Foucault (1999), Rosenthal and Thomas (2012 WP).
- No order book depth, so this matches up with Black (1977).
- Implied volatilities might be better for empirical analysis.

Changes

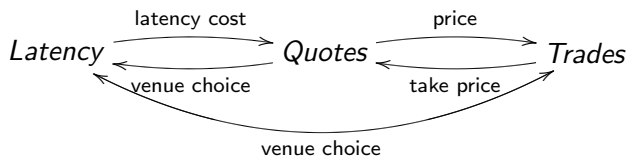
- Note that microsecond “latency” claims are not round-trip.
- *Info Week* quote of \$100 mn/ms from 1997; newer figure?
- No proof that rents are being extracted; so don't say so.
- Note that “prevailing” bid-ask is quoted, not effective spread.
- Would look beyond GS: SPY, S&P 500, Russell 3000.
 - Eliminates stock needing 200+ trades/day (bias-inducing).
- Would look at multiple days. (e.g. January, Q1 end, TW).
- Plots should also highlight current latencies (1–10 ms).
- Use turnover to get latency cost in dollars/year to industry.

Issues

- Traders see prices w/o delay? Trades delayed vs quotes.
 - Find optimal policy in that case, or note caveat.
- Only use NYSE trades. Troubling for a study of latency.
 - May explain why implied latencies seem a bit high.
- Should target median latency in 1995 (about 5%, not 10%).
 - May also explain why implied latencies seem high.
- $\Delta t \perp i$? Unlikely: latency higher at open, close.

Full Equilibrium \Rightarrow Endogeneity

- Latency, trade submission, and quotes result from equilibrium.
- Challenges assumption of exogenous trade prices, latency.
- Graphically:

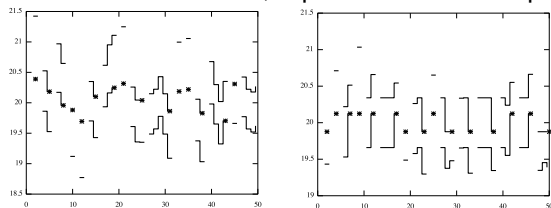


- Does this totally kill the work? Not at all.
 - Form of trading, latency linkage is not clear.
 - Can later extend model to equilibrium with that linkage.

Endogeneity Issues

In the meantime, some issues and partial fixes:

- Under endogenous latency, is pegging optimal? sensible?
- Trade decision \Rightarrow quoted, effective spreads will differ.
- For this reason, may be better to use effective spreads.
- To illustrate difference, equilibrium trades+quotes:



No market makers (left), 50% market makers (right). From Rosenthal and Thomas (2012 WP).

Selling/Policy Relevance

I think this is great work — so sell it more!

- Highlight contribution of introducing *implied latency*.
- Implied latency may help regulators anticipate systemic risk.
 - IL , ΔIL may have info about $\#, \Delta\#$ intermediaries.
 - Might indicate when intermediaries are hurt/deleveraging.
- Try to explain effects of proposals of minimum latency¹.
 - Could you quantify effect on social welfare, even roughly?
- Mention effect of SEC rules 11ac1-5, 11ac1-6² on IL .

¹This idea (*i.e.* hold trades at exchange for 2s) is being debated in Europe.

²These rules were the first implementation of what became Reg NMS.

Conclusion

- Very interesting paper; model is bursting with possibilities.
 - Shows how limit order pricing relates to latency.
 - Helps quantify cost of latency for practitioners.
 - Measure of market quality for academics, policy makers.
 - Another way to get at search costs, allocative efficiency?
- Also may be policy relevant and informative about:
 - Health of financial intermediary network (systemic risk?);
 - Effects of policies which mandate minimum latency.
 - How regulation like Reg NMS, MiFID have changed markets.