

Market impact emerges in generative LOB models trained only on next-token prediction

Paper: “LOB-Impact Benchmark: Emergent Market Impact in Generative Limit Order Book Models”

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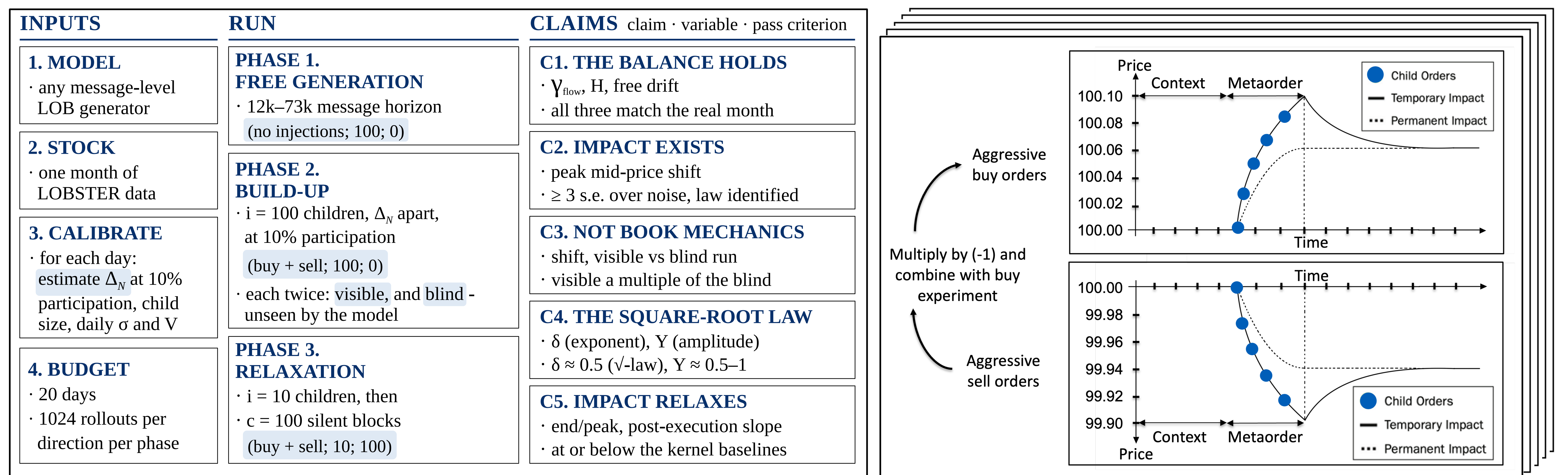
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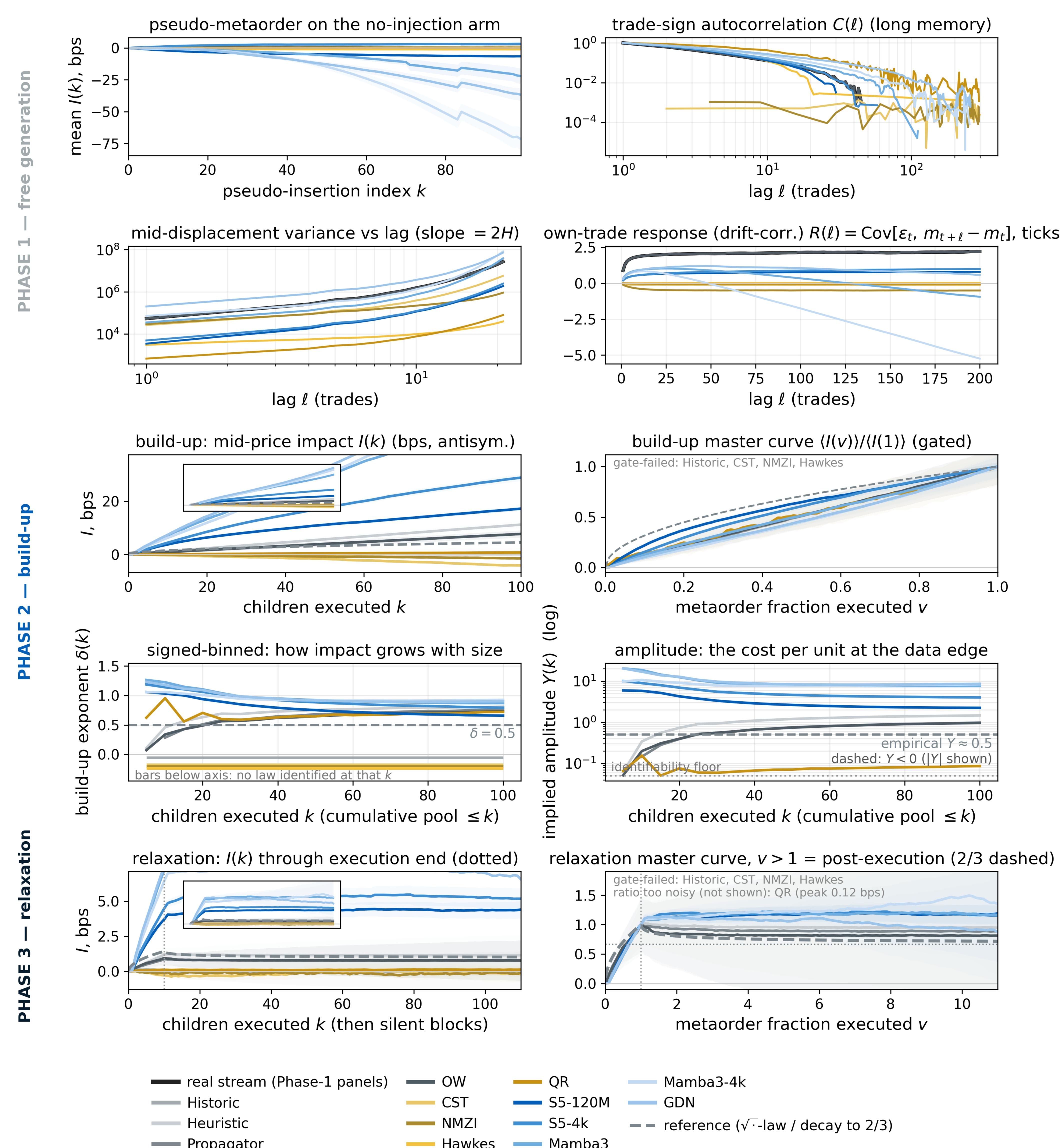


The benchmark tests a message-level generator in three phases on five claims



Extends benchmarks such as LOB-Bench [5] from single orders to metaorders. Each build-up also runs blind, unseen by the model; the visible-over-blind ratio is its own reaction.

Every model learns impact of its own, not yet the market’s



$\geq 3\times$ bigger price move when the model sees the orders.

Each model writes the order book token by token [4]. Every model answers a metaorder with an impact law, on every stock; a replay that cannot react does not answer at all.

Exponent $\delta = 0.63$ –1.21 against the market’s 0.5.

$$I(Q) = \sigma \cdot Y \cdot (Q/V)^\delta$$

An order Q moves the price by I , with daily volume V , volatility σ and an amplitude Y . With $\delta = 0.5$, the square-root law [1, 2], four times the order moves the price twice as far. On AMD the models’ Y is also 4–17 $\times$ the real one.

No decay after execution, where real books relax to 2/3 [3].

On AMD four of five models stay above their peak. Both failures point to persistent flow with too little replenishment, which we attribute to short context windows.

If a simulator misprices market impact, agents learn policies that are optimal in the simulator but wrong in the real market.

Try the benchmark on your model: bring a message-level generator and a month of LOBSTER data.



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AMD. Blue: the five neural generators. Grey and gold: baselines with known physics. Dashed: the square-root law and the decay to 2/3.

- [1] Bouchaud et al. Trades, Quotes and Prices. 2018
- [2] Almgren et al. Direct estimation of equity market impact. Risk 2005
- [3] Bucci et al. Slow decay of impact. 2019
- [4] Nagy et al. Generative AI for end-to-end LOB modelling. ICAIF 2023
- [5] Nagy et al. LOB-Bench. ICML 2025