

Discussion:

**“Learning from DeFi: Would Automated Market Makers
Improve Equity Trading?”**

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- Question: could we reduce equity trading costs by using AMMs instead of traditional LOBs?
- Model of AMM liquidity provision and demand, with endogenous fees and bounds on liquidity provision and demand.
- Use this model to compare AMM costs with empirically observed trading costs on centralized exchanges.
- Implication: conditions under which moving from LOB to AMM would be beneficial.

- Topical and important question.
- Nice modelling of AMM adverse selection costs and analysis of optimal fee design.
- Useful exercise to use the data to compute “in advance” the benefits of switching to AMMs for equity trading, and thus estimating the value of promoting AMMs.

Main Comments, 1: Source of AMM superiority

- The economic reason why AMM could dominate usual LOB is not discussed in the body of the paper.
- Possible explanations are provided in abstract/introduction/conclusion:
 - **“AMM allows for better risk sharing for liquidity providers and they use locked-up capital that otherwise sits idly at brokerages”** (p. 1)
 - [AMMs allow] **“pooled liquidity provision and shared adverse selection risk”** (p. 2)
 - **“a simple explanation: shared risk and repurposing of idle capital”** (p. 4)
- However, none of the proposed explanations maps to the model, notably because
 - Costs (σ) of using the LOB exogenous
 - Model works for single LP, unclear where risk-sharing appears.

Main Comments, 1: Source of AMM superiority

- The article does mention existing works that compare AMMs and LOBs and study the platform choice of informed traders (current working papers of Lehar and Parlour, Aoyagi and Ito, Aoyagi) and thus motivate the rationales mentioned above.
- Why not build on these approaches and instead consider an exogenous σ ?

Main Comments, 1: Source of AMM superiority

Similarly, for explanations put forward in the concluding section (p. 36), **“AMMs do not have these problems”** [of the LOB]:

- **“liquidity provision is passive”**: it can only be passive and not lead to losses if the degree of adverse selection does not increase (for given fees).
- **“and in expectation costless for the liquidity providers”**: only after fees have been added, just like the bid-ask spread allows liquidity provision to be costless in the LOB. + cash must be locked in AMM.

Main Comments, 2: **Validity of the comparison**

Possible rebuttal of my argument: **“There is no need to have a model for σ^* , since it is estimated directly from the data”.**

- Yes, but then the issue is that LOB data captures *total trading costs*, while the AMM model only features adverse selection cost.
- If part of LOB trading costs are fees that remunerate people who created the platform, then something needs to be said about such remuneration in the case of an AMM.

My suggestions:

- **convince us that adverse selection accounts for most of LOB trading costs**
- **show which equation/proposition captures, e.g., the AMM risk-sharing effect.**

Main Comments, 3: Other Remarks

- Being subjected to a fee F , **arbitrageurs will *not* trade until $p_t = V_t$** . Actually for $\frac{p_t}{p_0}$ close to 1, they would make a loss by trading.
 - **Consistency supply/demand sides for liquidity:**
 - for the LP problem, it is assumed that they face a balanced volume of liquidity trades V , a sequence of small orders buy/sell/buy/sell...
 - for the LD problem, the paper finds under which condition an order of size $q \neq 0$ will be carried out via the AMM
- Connection between q and V ? In particular:
- 1) **will it be optimal to use the AMM to post the reverting order $-q$ (and thus obtain a balanced V);**
 - 2) **under the former assumption, $q \approx 0$ and there is no constraint.**

- What would happen if N LP were simultaneously choosing their position a rather than a single LP ? → **possibly doable and useful robustness check.**
- Clarifying the timing of events would be useful (at least to me): first, a balanced order from liquidity traders V arrives, then arbitrageurs trade and adjust the price.

- **“The ratio c/a is the price for a marginal unit of the asset”** (p. 7): this is true only for CP rules, so the CP assumption should be introduced right from the start (same remark for the proof of Lemma 1, eq. (4) p. 13).
- The *ILLRAS* measure is well-known and usually called Impermanent Loss (as noted in Park (2023)), so I suggest continuing making a reference to the IL.
- It can be useful to immediately note that $ILLRAS(R) \leq 0$ with equality iff $R = 1$ (instead of postponing this remark).

- In **(15)**, it can be useful to elaborate on the fact that a normalization by p_0 is made, i.e. LOB trading costs are proportional to p_0 .
- The fact that fees earned depend on $|\Delta c|$, not Δc , should appear in all equations, not just when mandated by the economic interpretation.
- **“We ignore days with returns smaller than .5 and larger than 2”** (p.23-24): why? Isn't it when the adverse selection story is the most relevant?
- Proof of Proposition 1 is not necessarily needed, as it is clear, and also present in Park (2023).
- Typo in proof of Lemma 2: it is q^* , not p^* .