A Bound on Price Impact and Disagreement

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Discussion – March 2026

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This Discussion

- The null
- The equation
- Measurement

Flows

- Null hypothesis: no-trade theorem
- Empirically: lots of trade
- There must be "disagreement"
  - Lack of common prior
  - Idiosyncratic demand: hedging demands, institutional constraints...
- Triangulation: disagreement, price volatility, and trading volume
  - Some information on price impact of trade on prices

The equation

Elasticity and Price Impact.

- There are multiple demand curves

$$\Delta q_{it} = \mathcal{E}_i \Delta p_t + u_{it}$$

- There is only one price

$$\Delta p_t = \mathcal{M} u_{St}$$

Elasticity and Price Impact.

- From price volatility, I can say something about *individual* demand volatility
- From volatility of all demand shocks, I can say something about (aggregate) price volatility

$$\sigma^2(u_S) \propto \sigma_q^2,$$
$$\sigma_p^2 = \mathcal{M}^2 \cdot \sigma^2(u_S).$$

The equation (continued)

Elasticity and Price Impact.

$$\sigma^2(u_S) \propto \sigma_q^2,$$
$$\sigma_p^2 = \mathcal{M}^2 \cdot \sigma^2(u_S).$$

- It is hard to go out and aggregate all the demand shocks around: $\sigma(u_S)$
- It is easier to measure change in positions: σ_q^2
- With some structure we can recover the proportional factor between demand shocks and positions

$$\sigma_q^2 = (\rho^{-1} - 1)\sigma^2(u_S)$$

- From equation above this gives the price impact coefficient

$$\mathcal{M}^2 = \frac{\sigma_p^2}{\sigma^2(u_S)} = \frac{\sigma_p^2}{\sigma_q^2}\left(\rho^{-1} - 1\right)$$

- Is ρ easier to measure and interpret than u_S would be?

Measurement

Market Clearing.

- Not unrelated to no-trade theorem, changes in portfolio positions are deviations from average demand:

$$\Delta q_i = u_i - u_S$$

- Some structure on individual demand: $u_i = \beta_i, u_S + v_i$

$$\Delta q_i = u_i - u_S = (\beta_i - 1)u_S + v_i$$

- Decomposition of "Disagreement"

$$\sigma_q^2 = \sigma^2(u_S) \underbrace{\sum_i S_i(\beta_i - 1)^2}_{\sigma_{\text{CS}} \text{ loadings } \beta_i} + \underbrace{\sum_i S_i \sigma_{v,i}^2}_{\sigma_{\text{CS}} \text{ in idiosyncratic demand}}$$

- Implications for measurement: flow regressions on factors

Individual demand for individual stocks

Model misspecification.

- Case of two assets

$$\Delta q_{it}^1 = (\beta_i - 1)u_S^1 + v_i^1 + \gamma u_S^2 + \cdots$$

- Formally (see HHHKL) write demand system and solve for fundamental equations
  - How do fundamental shocks, u_S affect individual demand curves
  - Simple elasticity/price impact matrix with one factor $\mathcal{E} = \mathcal{E}_{\text{relative}}\mathbf{I} + \mathcal{E}_{\text{agg}}\mathbf{1}\mathbf{1}^\top$

$$\Delta q_i^1 = u_i^1 - \frac{\alpha_i^{\text{agg}} + \alpha_i^{\text{rel}}}{2} u_S^1 - \frac{\alpha_i^{\text{agg}} - \alpha_i^{\text{rel}}}{2} u_S^2$$

- Changes in positions are informative about both aggregate shocks to asset 1 and asset 2...

$$\sigma_{q^1}^2 = \mathrm{Var}_{CS}(u_i^1) + a_i^2 \mathrm{Var}_{CS}(u_S^1) + b_i^2 \mathrm{Var}_{CS}(u_i^2) + a_i b_i \mathrm{Cov}_{CS}(u_S^1, u_S^2)$$

What is the bound a bound for?

Price impact is not a number.

- Main price impact equation $\Delta \mathbf{P} = \mathcal{M} \Delta \mathbf{D}$
- Bound recovers not $\mathcal{M}_{11}$ but some linear combination
- How is it useful? ... which questions is the bound the answer to?

Measurement

What is ρ?

- Mix of idiosyncratic demand which can be liquidity/hedging/priors
- Focusing on one source of heterogeneity a lower bound for ρ?
- Too much focus on disagreement may distract us from larger sources of heterogeneity

Final Thoughts

Great Paper! Worth reading.

Take away

- Making progress on linking the demand agenda to existing research on volume
- A potential solution to volatility puzzles