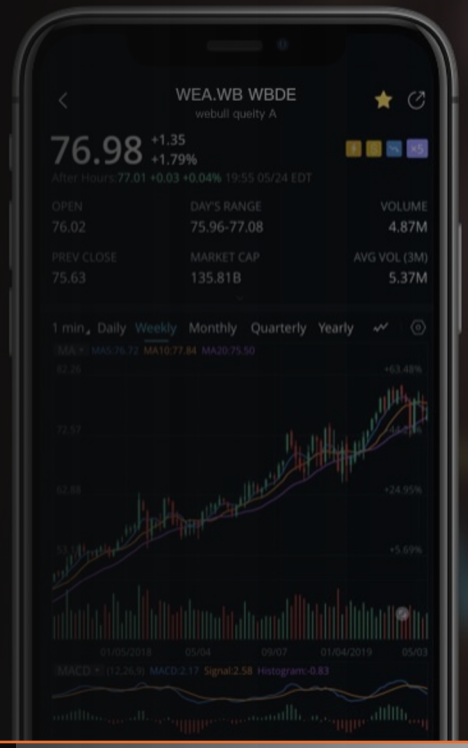
The Hidden Cost of 'Zero Commission'



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Yes, You Can Get Free Trading. But There's Often a Catch.

A price war has driven the cost of some stock trades to zero. But brokerages have to make money somehow, and here are some of the ways.

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A New Age of Trading

Traditional Exchanges

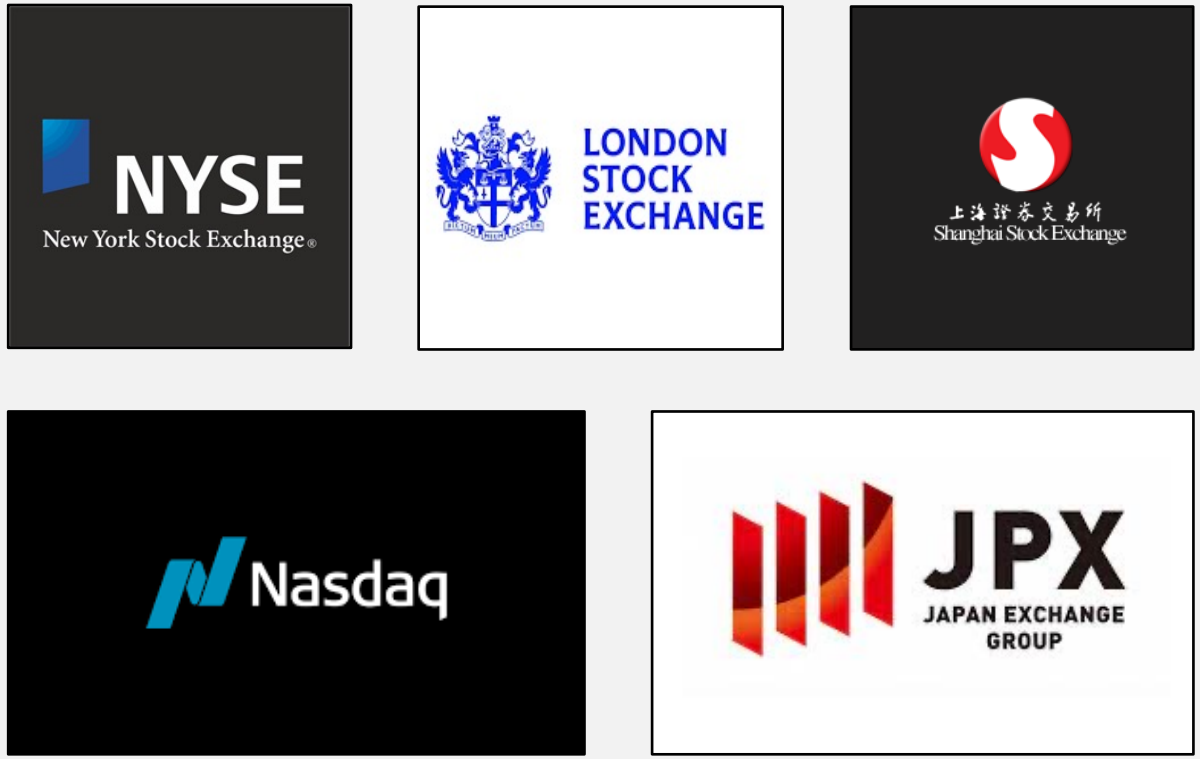

Figure 1. Five of the world's leading stock exchanges.

Online Trading Platforms

Figure 2. Five of the world's leading online trading platforms. In 2023, the market was valued at $10.98 billion with CAGR of 6.7%.

Competing Business Models

Transparent Transaction Costs

Transactions in stocks with a per share stock price of $1.00 or more

Non-Tier Adding Credit – Equity per Share Credit - per transaction - for all orders, other than Mid-Point Liquidity ("MPL") and Non-Displayed Limit Orders that add liquidity to the NYSE unless a higher credit applies	$0.0012
Adding Credit for Non-Displayed Limit Orders when adding liquidity to the NYSE unless a higher credit applies.	No credit
Non Display Tier 2 If the member organization has Adding ADV in Non-Displayed Limit Orders that is at least 0.12% of Tapes A, B and C CADV combined, excluding any liquidity added by a DMM.	$0.0010 0.10% of the total dollar value of the transaction for securities with a per share stock price below $1.00
Non Display Tier 1 If the member organization has Adding ADV in Non-Displayed Limit Orders that is at least 0.15% of Tapes A, B and C CADV combined, excluding any liquidity added by a DMM.	$0.0018 0.18% of the total dollar value of the transaction for securities with a per share stock price below $1.00
If the member organization has Adding ADV in Non-Displayed Limit Orders and MPL Orders in Tapes A, B and C CADV combined, excluding any liquidity added by a DMM, that is at least 0.02% of NYSE CADV over that member organization's May 2020 adding liquidity in Non-Displayed Limit Orders and MPL Orders taken as a percentage of NYSE CADV.	$0.0005 if an increase of at least 0.02% and less than 0.04% $0.0010 if an increase of at least 0.04% and less than 0.08% $0.0015 if an increase of at least 0.08% or more

Figure 3. An excerpt of the NYSE's extensive regulation of transaction costs.

Zero-Commission Model

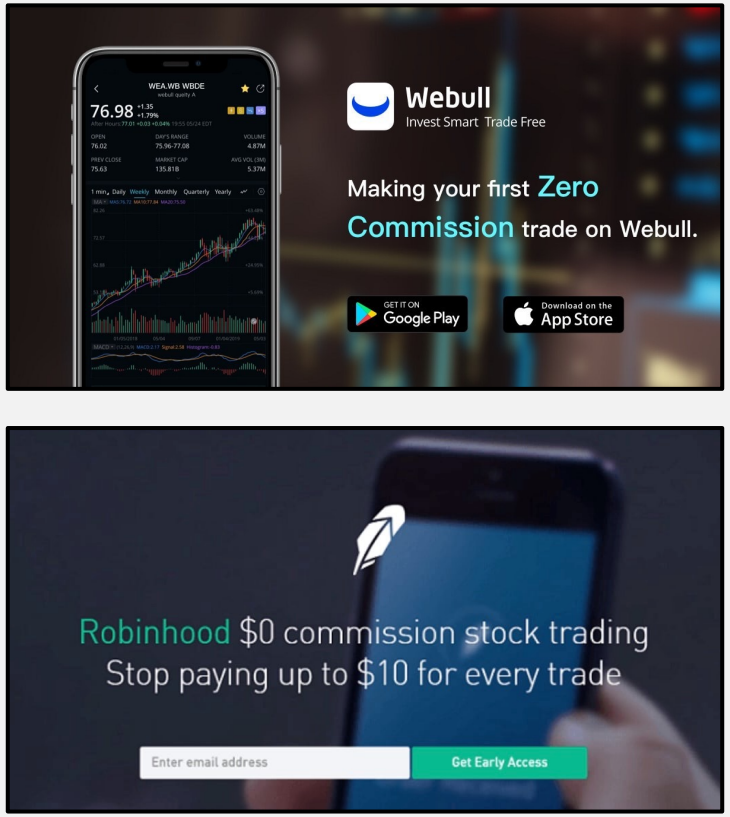

Figure 4. Online trading platforms promote trading without transaction costs to reduce traders' costs.

The Truth behind ‘Zero-Commission’

Payment for Orderflow

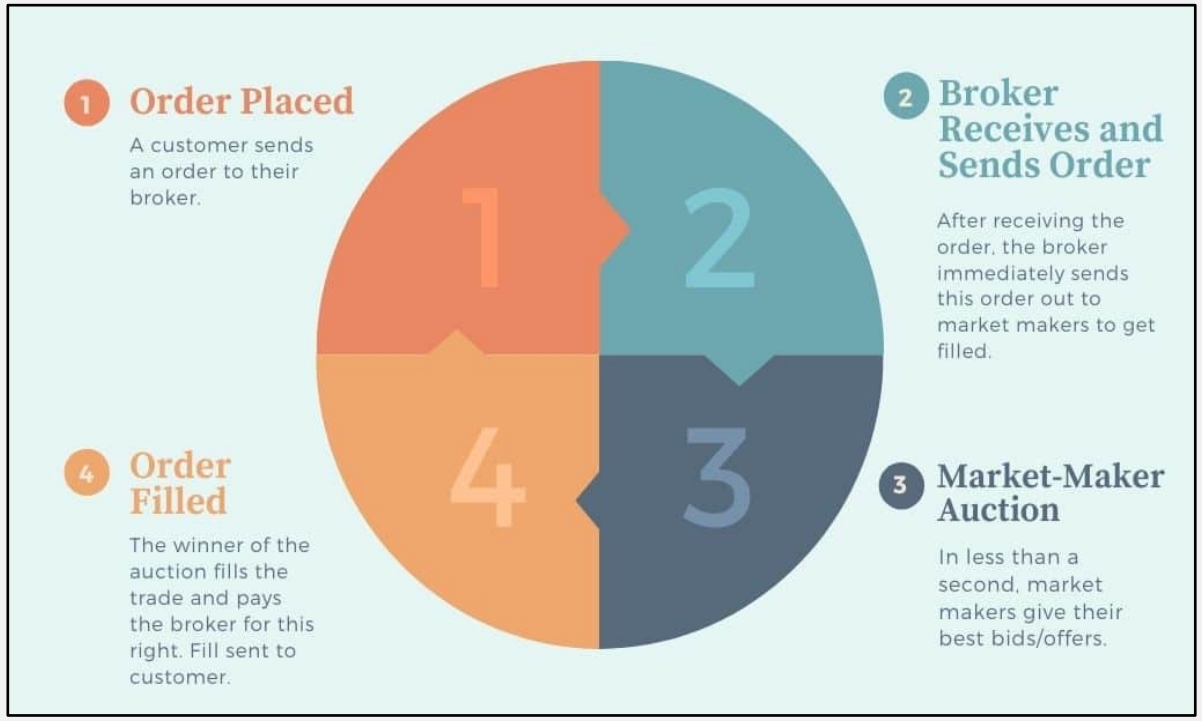

Figure 5. Customer = retail trader, broker = online trading platform, and market maker = financial institution that buys/sells financial assets.

- Robinhood: ~ 70% of revenue is generated by PFOF.
- Citadel Securities: $2.6 billion per year spent on PFOF.

A Divisive Debate

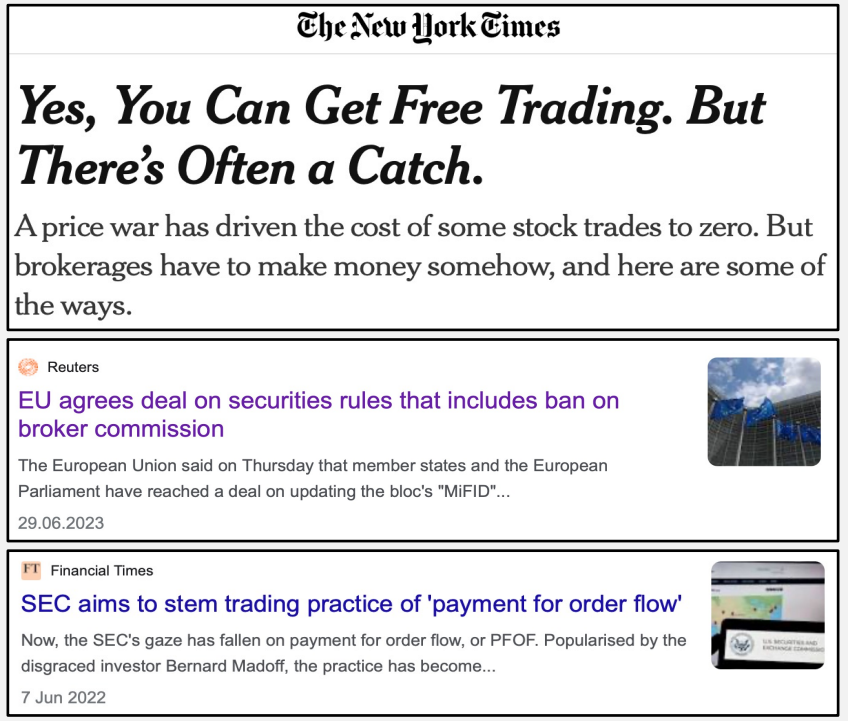

Figure 6. Zero-commission models & PFOF have received significant regulatory attention: Conflicts of best price execution & transparency.

Zero-commission ↔ Hidden transaction costs

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The Traders

Traders. Unit mass of buyers $\mathcal{B}$ & sellers $\mathcal{S}$ with distribution μ_B & μ_S

- Today: Unit demand & supply ↔ Densities = 1

Limit orders. Trader i submits value $v_i \in [1,2]$

- Buyer (seller): Max. (min.) price, at which they are willing to trade

Demand & supply. Aggregation of limit orders

- $D(P) = \mu_B\{b \in \mathcal{B}: v_b \geq P\}$ & $S(P) = \mu_S\{s \in \mathcal{S}: v_s \leq P\}$
- Assumptions: Strictly monotone $\mathcal{C}^1$ functions

Market-clearing price. P_{eq} with $D(P_{eq}) = S(P_{eq})$

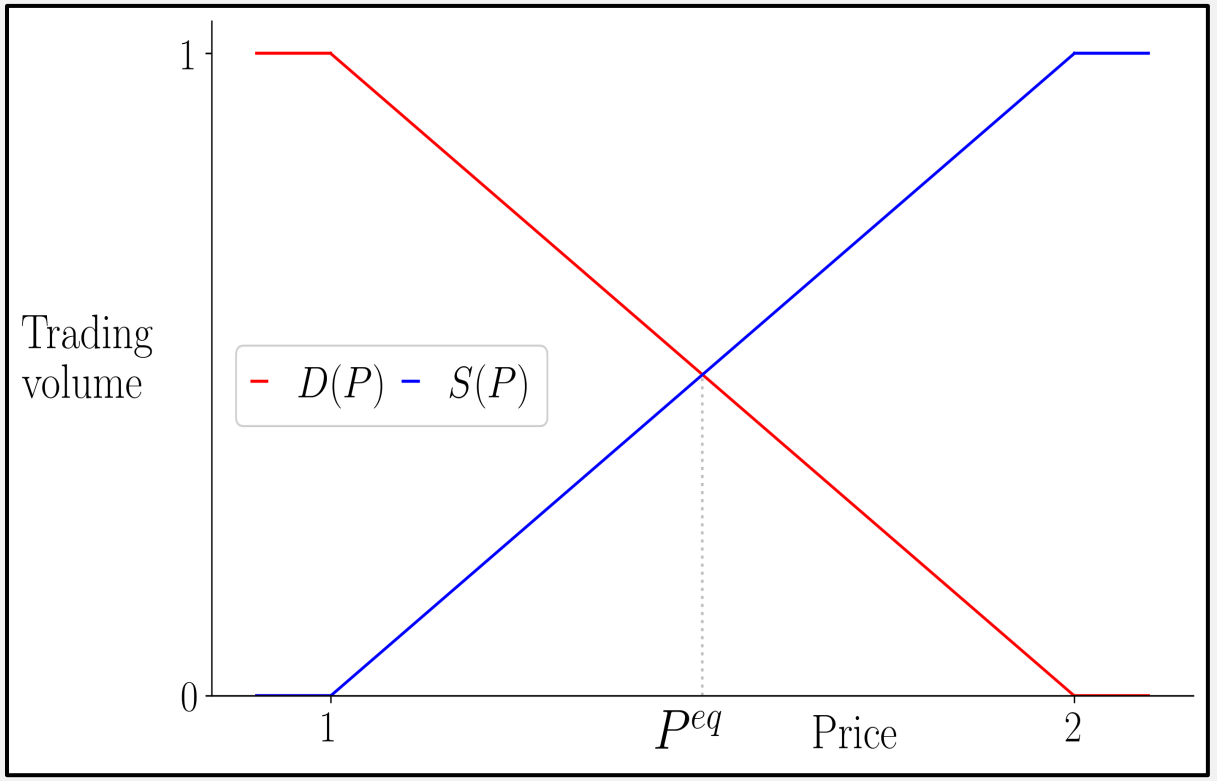

Figure 7. Baseline market with linear demand & supply over the interval $[1,2]$, that is, $D(P) = 2 - P$ & $S(P) = P - 1$. The market-clearing price is $P_{eq} = 1.5$.

The Market Platform

- Observes demand & supply (**orderbook**)
- Sets a **buy price** P_b & a **sell price** P_s
  → **Bid-ask spread** $\sigma = P_b - P_s$
- Executes buy orders $\mathcal{B}^* \subseteq \mathcal{B}$ & sell orders $S^* \subseteq S$
  → $\mu_B(\mathcal{B}^*) = \mu_S(S^*) = Q$ (**Trade balance**)
- Active buyers pay P_b & active sellers receive P_s
- **Platform revenue:** $R(\sigma) = (P_b - P_s) \cdot Q$
- **Gains of Trade**: $GoT = \int_{\mathcal{B}^*} v_b \mu_B(b) - \int_{S^*} v_s \mu_S(s)$
- **Efficiency**: $Eff = \frac{GoT}{GoT^{max}}$

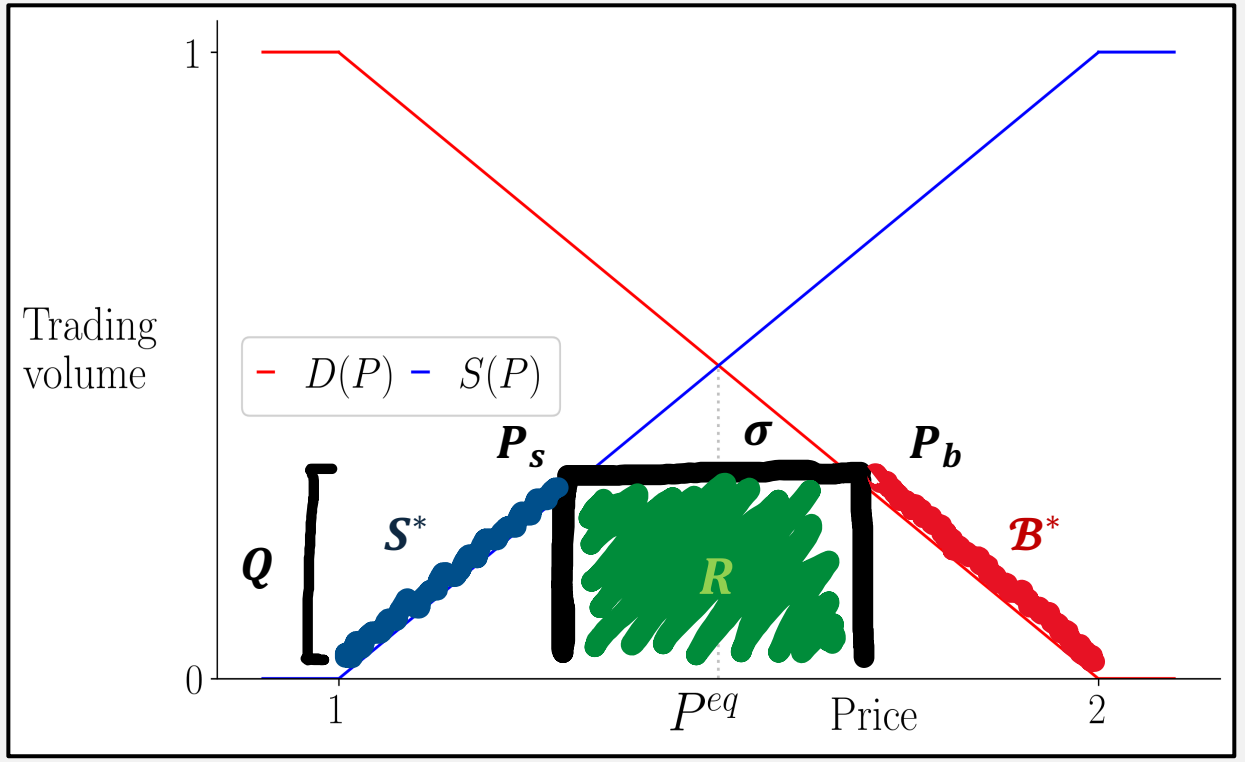

Figure 8. Baseline market with linear demand & supply over the interval $[1,2]$, that is, $D(P) = 2 - P$ & $S(P) = P - 1$. The market-clearing price is $P_{eq} = 1.5$.

The Market Dynamics

Arrival. New traders arrive at times $t = 1,2, \ldots$

- Constant incoming value distributions: $D^0(P)$ & $S^0(P)$

Market Clearing. At time step t, the platform

- sets buy & sell price + executes some orders

Departure. Unexecuted orders stay with prob. $\varepsilon \in (0,1)$.

- $Z_D^t(P)$ & $Z_S^t(P)$: Excess demand & supply at time t.
- $D^{t+1}(P) = D^0(P) + \varepsilon \cdot Z_D^t(P)$ & $S^{t+1}(P) = S^0(P) + \varepsilon \cdot Z_S^t(P)$

Platforms Objective. Revenue maximization

- per round (today) or in the long-run (in general)

Long-run Efficiency. $Eff^{\infty} = \lim_{t \to \infty} \frac{\sum_{t=1}^{\infty} GoT^t}{t \cdot GoT^{max}}$

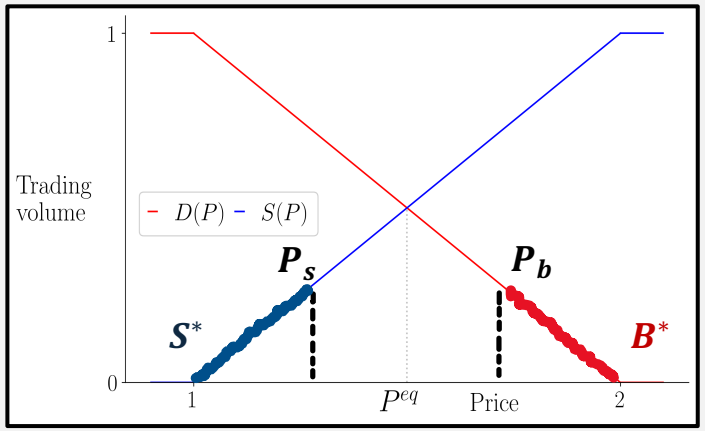

Figure 9a. *1st round:* New traders arrive with linear demand and supply.

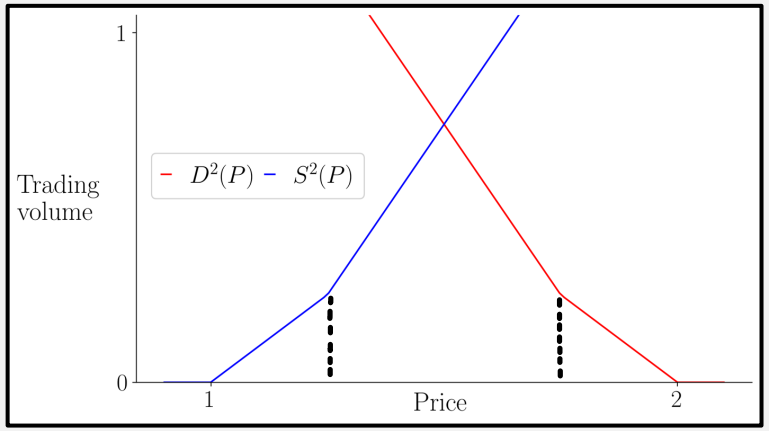

Figure 9b. *2nd round:* New traders arrive & 95% of unexecuted orders remain.

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Two Classes of Transaction Costs

Transparent Transaction Costs

Buy & sell prices. Functions of P_{eq} (*ex-ante*)

- $P_b = F_b(P_{eq}) \geq P_{eq}$ & $P_s = F_s(P_{eq}) \leq P_{eq}$
- Constant TCs: $F_b(P) = P + c$ & $F_s(P) = P - c$

Allocation. Buy orders $\geq P_{eq}$ & sell orders $\leq P_{eq}$

Traders' behaviour. Adjust value to account for TCs

- Constant fees: $v_b^{net} = v_b^{gross} - c$ and $v_s^{net} = v_s^{gross} + c$

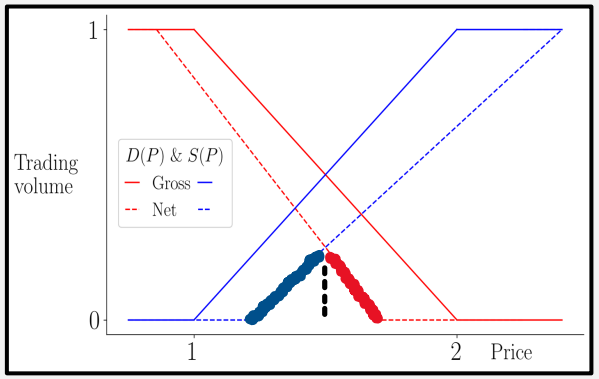

Figure 10 (Price fees). Net values (Left.) and revealed demand and supply (Right.)

Hidden Transaction Costs

Buy & sell prices. Chosen *ex-post*

- without any commitment
- only constraint: $D(P_b) = S(P_s)$

Allocation. Buy orders $\geq P_b$ & sell orders $\leq P_s$

Traders' behaviour. No adjustment needed

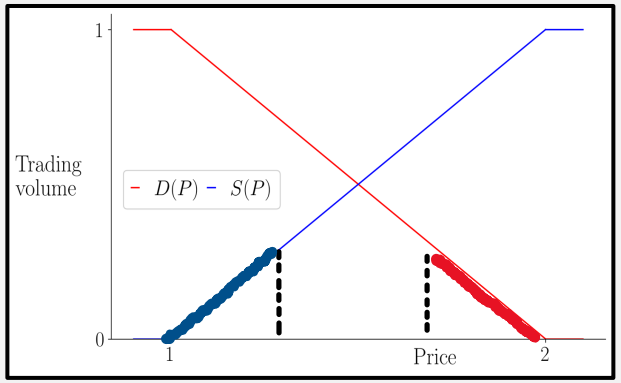

Figure 11 (Hidden TCs). Net values (Left.) and revealed demand and supply (Right.)

The Static Market

Proposition (Equivalence). *In a static market, the same set of market performances can be achieved for hidden transaction costs and transparent transaction costs.*

Transparent Transaction Costs

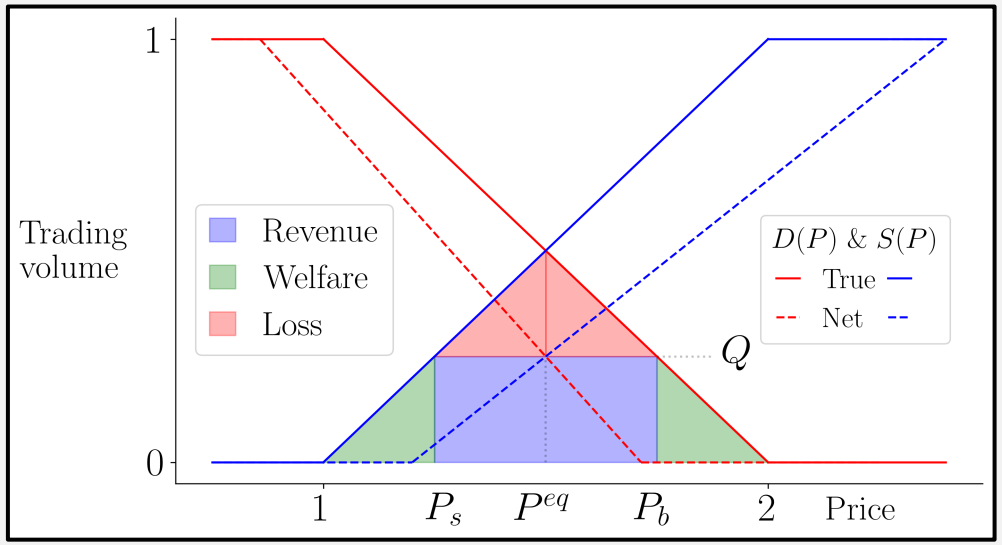

Figure 12. Market performance is specified by the trading volume. Any trading volume is achievable by scaling TCs (Jantschgi et al. 2024).

Hidden Transaction Costs

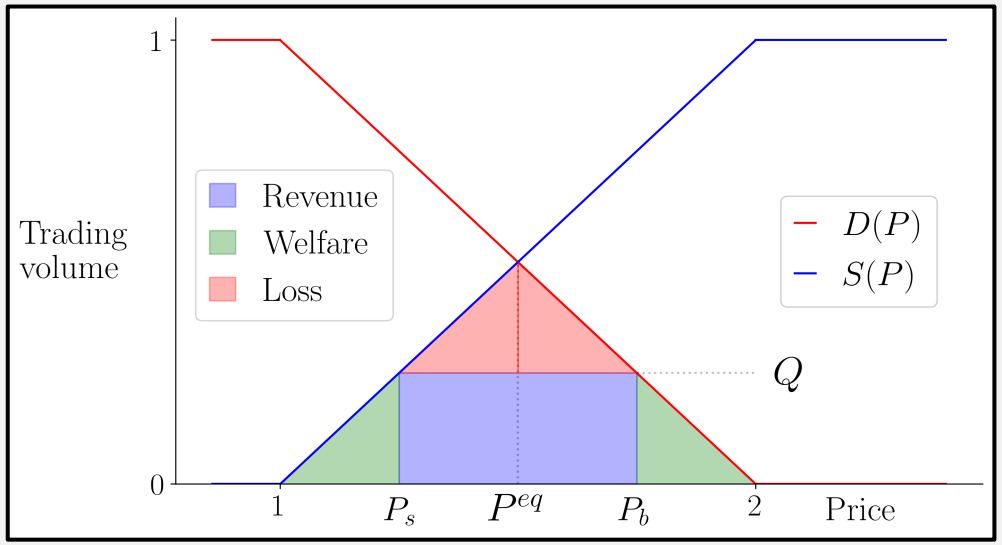

Figure 13. The market performance is fully specified by the trading volume. Any trading volume is achievable by setting the spread.

The Dynamic Market

Theorem (Transparent TCs → Stable Prices).

1. *Excess demand & supply do not influence the market-clearing price. It remains constant over time.*
2. *Thus, as the spread is a deterministic function of the market-clearing price, it remains constant over time.*

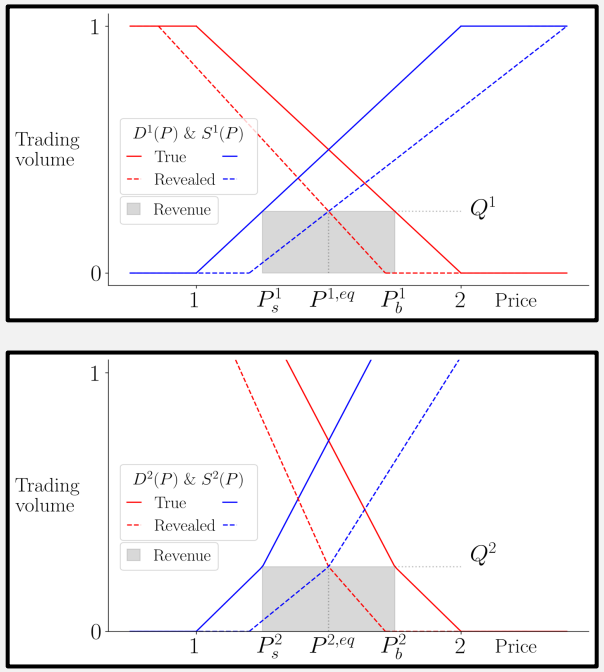

Figure 14. Evolution of a market with linear demand and supply and price fees.

Theorem (Hidden TCs → Price Cycles).

1. *Short-run: The spread gradually decreases, before it jumps back to a wider baseline.*
2. *Long-run: After every new global minimum, the sequence resets and starts from the beginning.*

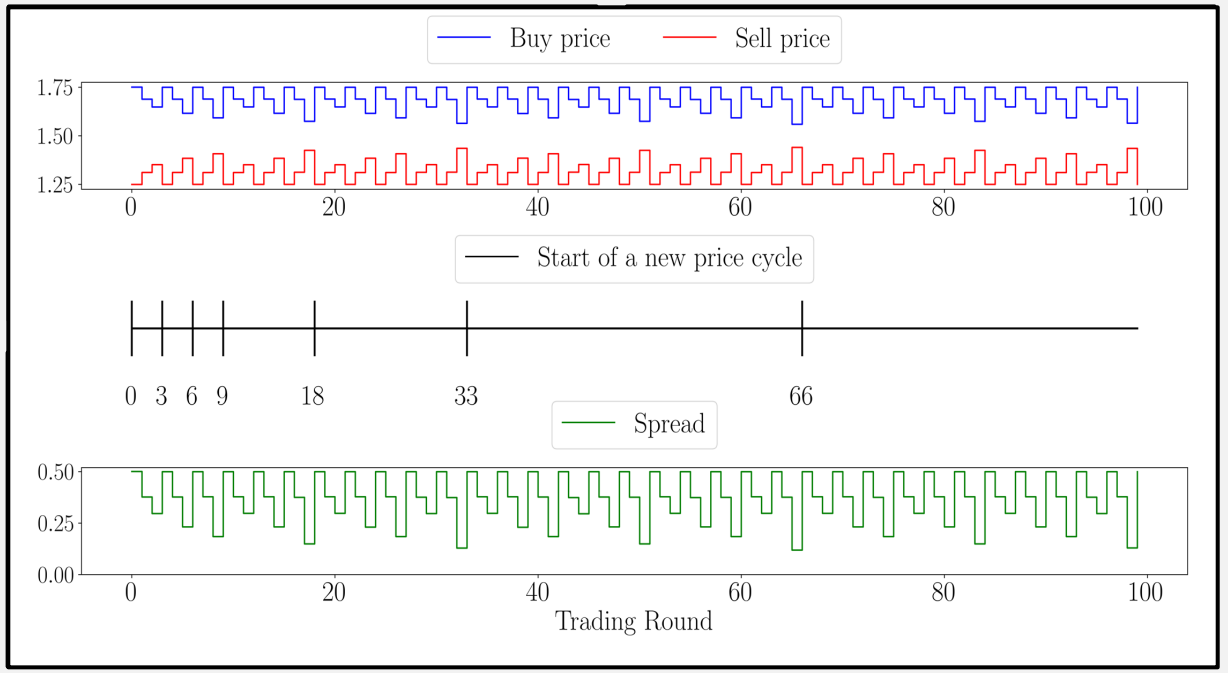

Figure 15. Evolution of the market with linear demand and supply for the first 100 rounds.

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Equilibrium Analysis

Traders' Beliefs.

- Transparent TCs → Deterministic belief $\sigma^T > 0$
  → Market ≈ Deterministic lottery
- Hidden TCs → Beliefs about cycle $\sigma^H > 0$
  → Market ≈ Proper lottery

Traders' Utility. CARA $\leftrightarrow u_\alpha(\sigma) = \frac{(1-e^{-(1-\sigma)\alpha})}{\alpha}$

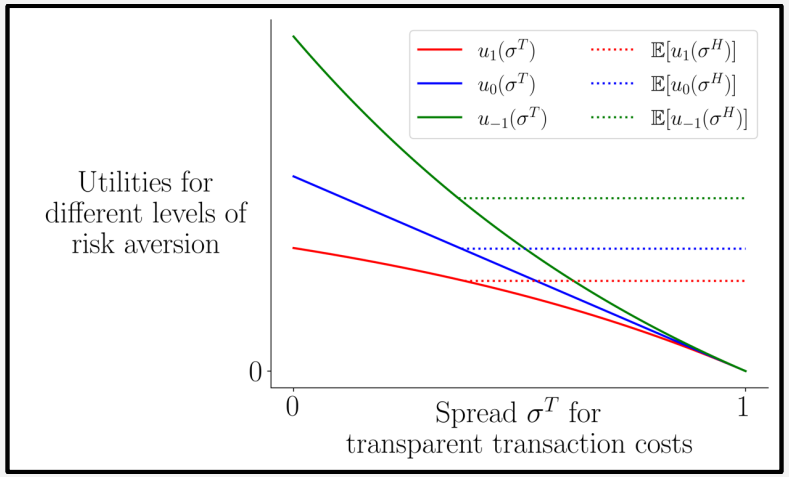

Figure 17. Different levels of risk aversion.

Equilibrium. (σ^T, σ^H) with $u_\alpha(\sigma^T) = \mathbb{E}_i[u_\alpha(\sigma^H)]$

Theorem. An equilibrium (σ^T, σ^H) exists.

- *Comparative statics*: σ^T *is stric. increasing in* α.
- *Sub-monopoly pricing*: $\sigma^T < \sigma^0$
- *Efficiency*: *High* $\alpha \rightarrow$ $Eff^\infty(\sigma^T) < Eff^\infty(\sigma^H)$
  Low $\alpha \rightarrow$ $Eff^\infty(\sigma^T) > Eff^\infty(\sigma^H)$

Extension. Traders have different risk-attitudes

→ Equilibrium existence + Market segmentation

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Forward-Looking Traders

Strategic market entry for patient traders.

- Aggressive limit order → not executed immediately, but at a good point in the cycle
- Traders estimate the lowest spread in the cycle

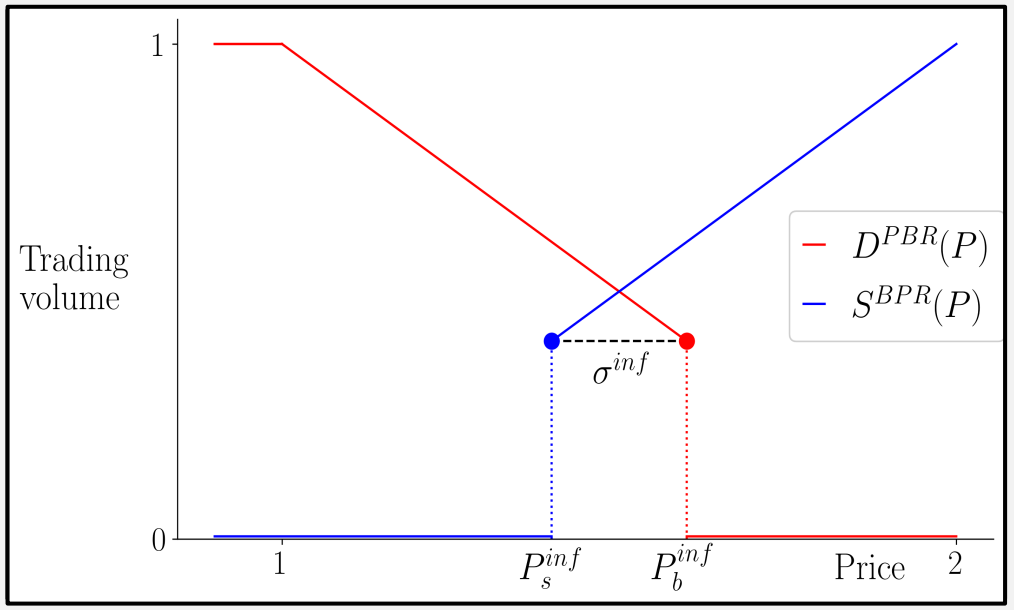

Figure 18. Traders guess lowest point of the cycle.

Meta Theorem. *Strategic market entry*

- *is irrelevant for transparent TCs.*
- *can lead to market failure for hidden TCs.*

Problem with hidden TCs

a. Traders guess lowest spread σ
b. Excess demand & supply after σ
c. New price cycles with σ as baseline
d. Traders guess new minimum
e. Iterate until baseline is not profitable

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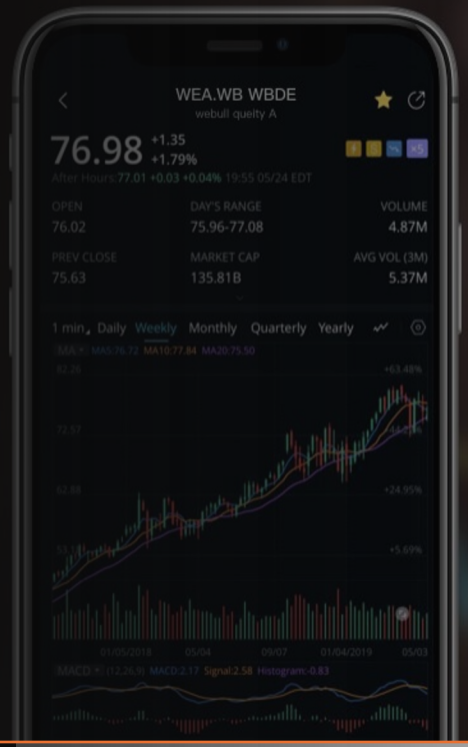
There is a hidden cost of ‘zero commission’…

… but it’s not a priori clear who pays it.



Maybe the Traders.

Myopic traders may incur increased costs due to market volatility.

Maybe the Platform.

Forward-looking traders may reduce its revenue, up to market failure.

The New York Times

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A price war has driven the cost of some stock trades to zero. But brokerages have to make money somehow, and here are some of the ways.