Discussion of "Would Order-By-Order Auctions Be Competitive?" by Thomas Ernst, Chester Spatt and Jian Sun

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$$\zeta_i = c_0 + c_1 \frac{1}{N} \sum_{j=1}^{N} y_j + c_2 y_i$$

- Parameter interpretation
  - c_0: cost shifter.
  - c_1 : common-value weight.
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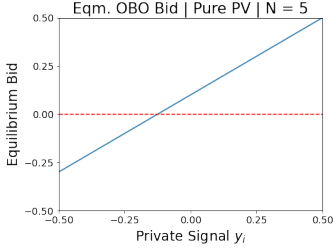
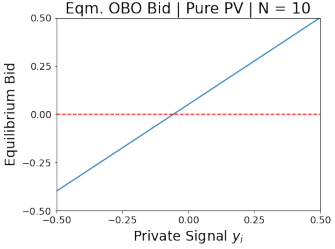
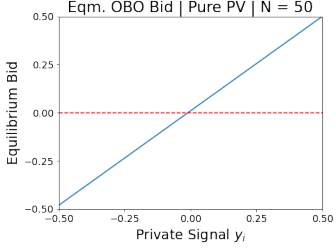
- Auction game
  - Retail investor arrives wanting to trade one unit. Uninformed.
  - Each market maker bids s_i, the "half bid-ask spread."
  - First-price auction, lowest s_i wins, receives payoff $s_i - \zeta_i$
  - Important note: s_i can be *negative* in equilibrium. Possible interpretation is that the retail investor receives a price better than the midpoint.

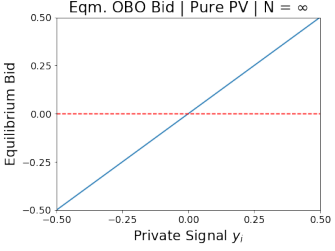
Equilibrium: Pure Private Values Case

($c_0 = 0, c_1 = 0, c_2 = 1$)



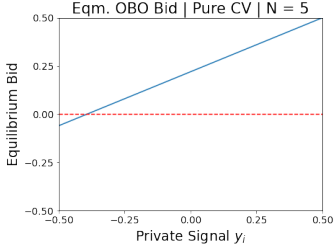


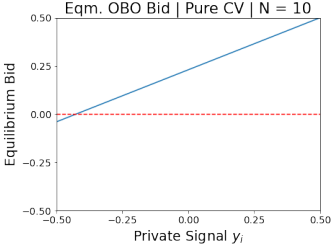


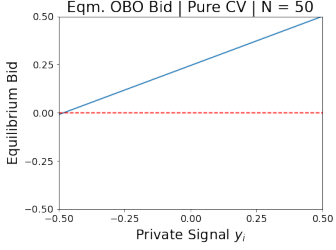


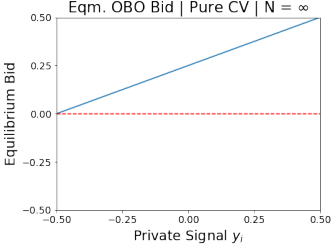
Equilibrium: Pure Common Values Case

$(c_0 = 0, c_1 = 1, c_2 = 0)$









Equilibrium: Mix of Private Values + Common Values

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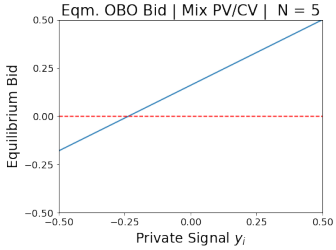
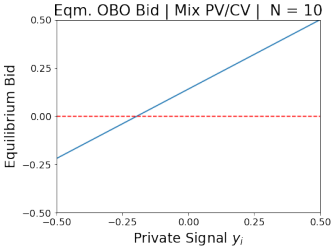
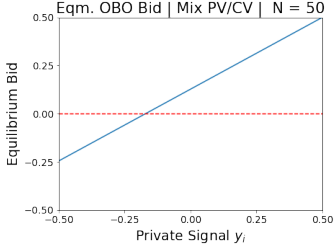
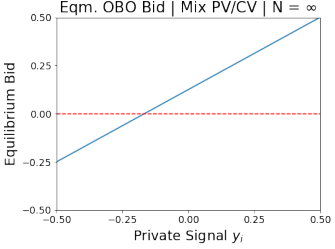
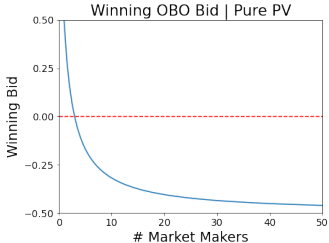


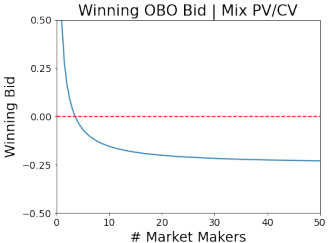


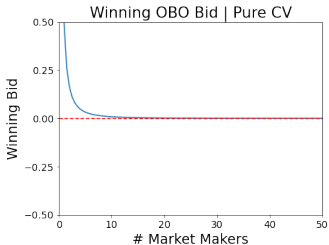




Equilibrium Winning Bids







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- If the private-value weight c_2 is sufficiently large and the number of bidders N is sufficiently large, can get a *negative* winning bid in equilibrium
  - Interpretation: retail investor gets a price better than the midpoint (or, better than the average inventory cost c_0 if we don't normalize that to 0)
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- Bidders rationally account for a winner's curse if there is a common value component. In the pure CV case, we get the famous Milgrom-Wilson intuition that the price aggregates information.

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  - So that's about 130M per month
- So for any one order ... we should treat $p_0 \approx 0$.

Model of Broker Routing

- As a reminder of the technical details of the model of BR: exactly the same as OBO competition but for one key difference. Instead of observing their signal y_i for the particular order:
  - With probability p_0: the market maker sees y_i
  - With probability $1 - p_0$: the market maker sees an uninformative draw from the same distribution, $U[-\frac{1}{2}, +\frac{1}{2}]$
  - (Interpretation: "market-maker performance is evaluated in the aggregate but not order-by-order, and market makers do not have a choice in when they want to accept order flow from the broker")

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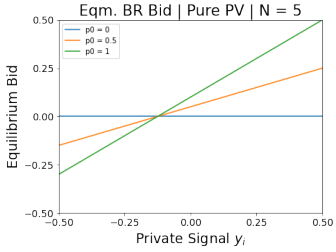
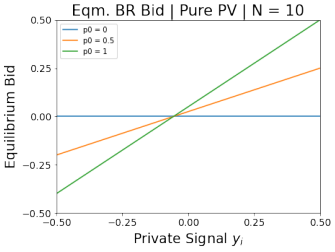
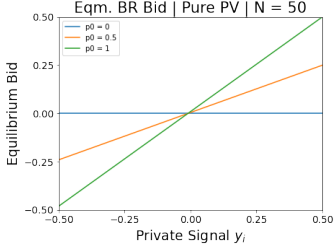
- And what happens in the limit as $p_0 \to 0$?
  - That is, when competition is in the aggregate, as opposed to the individual order?
- Bertrand competition on average costs.
  - Nobody has any information.
  - We all bid our expected costs, which are equal because we are all ex-ante identical.
  - So we all bid exactly zero.

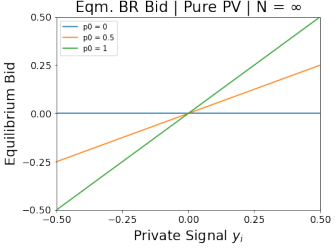
Equilibrium of Broker Routing ($p_0 = 1, 0.5, 0$)

(Pure PV: $c_0 = 0, c_1 = 0, c_2 = 1$)









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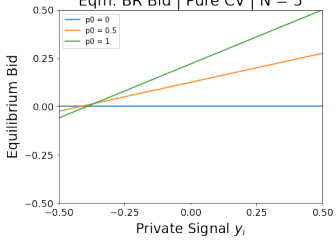

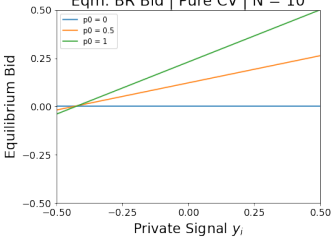

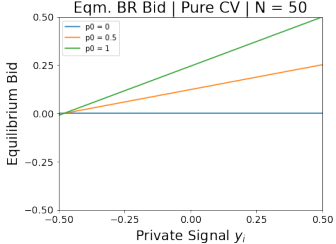

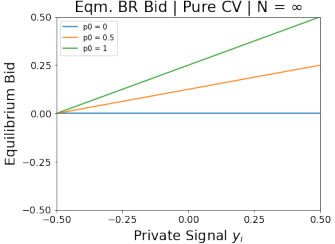

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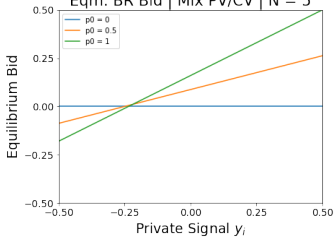

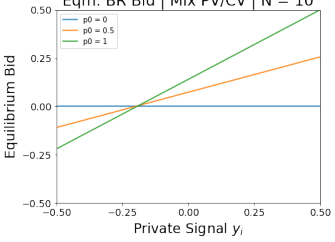

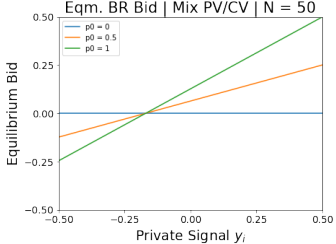

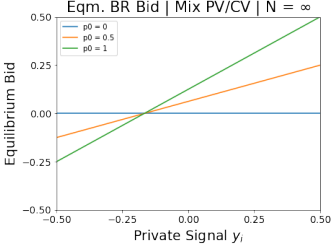

Equilibrium of Broker Routing

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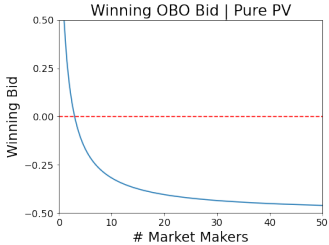
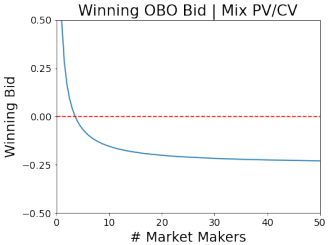
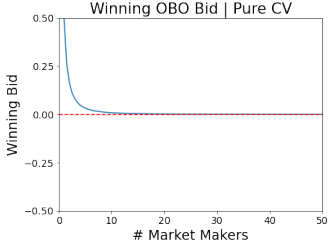
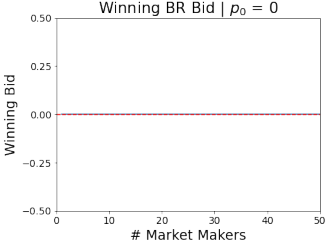
  - Which we can think of as bidding the midpoint
  - Or a small positive amount if the average inventory cost c_0 is positive.
- Importantly: this is worse than the equilibrium price in order-by-order competition for reasonable cases where entry N is decent and there is some weight on private values c_2
  - Need N very low and private-value weight c_2 very low to get BR better than OBO

Equilibrium Winning Bids: Comparison of OBO and BR









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  - "... we abstract away from agency problems between the investor and the broker, and assume that the broker's objective is to maximize the investor's welfare, which in our model is equivalent to minimizing the spread." (pg. 8)

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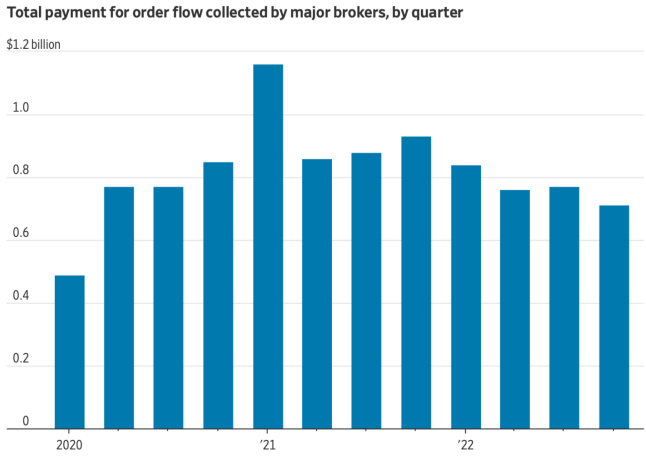
  - (Is the assumption even plausible as a legal matter? Don't publicly traded brokers have a duty to their shareholders to maximize profits, which is in tension with maximizing investor welfare?)
- So my substantive concern is:
  - While the broker-routing model has a lot of moving pieces
  - If you take the most natural limiting case ($p_0 = 0$), where law-of-large-numbers kicks in, the model of BR implies zero economic rents.
  - And if you just look in the world, there is economic rent.

Payment for Order Flow: Magnitudes



Note: Brokers included in total are Ally Invest, Apex, Charles Schwab, E*Trade, Fidelity, Interactive Brokers, Robinhood, TD Ameritrade, TD Ameritrade Clearing, Tastyworks, Tradestation and Webull.

Source: "Robinhood Hits Back at SEC, Warns of Threat to Zero-Commission Trading," Wall Street Journal, Feb 7th 2023.

Broker Routing Realized Spreads: Magnitudes

Table 7: Wholesaler CAT Analysis of Exchange Individual Investor Order Execution Quality for Marketable Orders in NMS Common Stocks and ETFs by Type of Stock

Panel A: Wholesaler and Exchange Execution Quality

Variable	All	SP500	NonSP500	ETF
Average Price	$29.87	$110.31	$10.52	$53.14
WH Principal Execution Rate	90.44%	93.07%	87.66%	88.12%
WH Share Volume (billion shares)	87.11	11.63	63.17	12.31
EX Share Volume (billion shares)	281.90	66.98	140.82	74.10
WH Dollar Volume (billion $)	$2,601.44	$1,282.62	$664.41	$654.41
EX Dollar Volume (billion $)	$16,194.84	$6,479.89	$3,246.09	$6,468.85
WH Effective Spread (bps)	2.11	0.67	6.23	0.76
EX Effective Spread (bps)	3.18	1.52	8.11	1.42
WH Realized Spread (bps)	0.85	0.42	2.00	0.51
EX Realized Spread (bps)	-1.22	-0.28	-3.90	-0.34
WH Realized Spread Adj PFOF (bps)	0.49	0.29	0.99	0.36
EX Realized Spread Adj Rebate (bps)	-0.40	-0.06	-1.54	0.08
WH Price Impact (bps)	1.26	0.25	4.22	0.25
EX Price Impact (bps)	4.40	1.80	12.00	1.75
WH E/Q Ratio	0.39	0.32	0.50	0.41
EX E/Q Ratio	1.04	1.01	0.98	1.17

Source: SEC Order Competition Rule Proposal, Page 224.

Broker Routing Realized Spreads: Magnitudes

Table 18: Competitive Shortfall Rates Estimates

Data Source	Stock Type	All	S&P 500	Non-S&P 500	ETF
Rule 605	WH Realized Spread (bps)	0.72	0.30	1.55	0.64
Rule 605	EX Realized Spread (bps)	-0.67	-0.30	-1.97	-0.12
Rule 605	EX Realized Spread Adj Rebate Base (bps)	-0.001	-0.05	-0.24	0.28
Rule 605	EX Realized Spread Adj Rebate High (bps)	0.19	0.02	0.25	0.41
Rule 605	EX Realized Spread Adj Rebate Low (bps)	-0.20	-0.12	-0.73	0.15
CAT	WH Realized Spread (bps)	0.85	0.42	2.00	0.51
CAT	EX Realized Spread (bps)	-1.22	-0.28	-3.90	-0.34
CAT	EX Realized Spread Adj Rebate Base (bps)	-0.40	-0.06	-1.54	0.08
CAT	EX Realized Spread Adj Rebate High (bps)	-0.18	0.00	-0.90	0.20
CAT	EX Realized Spread Adj Rebate Low (bps)	-0.63	-0.12	-2.19	-0.05
Rule 605	Competitive Shortfall Rebate Base (bps)	0.58	0.30	1.42	0.26
Rule 605	Competitive Shortfall Rebate High (bps)	0.38	0.23	0.93	0.13
Rule 605	Competitive Shortfall Rebate Low (bps)	0.77	0.37	1.91	0.38
CAT	Competitive Shortfall Rebate Base (bps)	1.08	0.44	3.07	0.34
CAT	Competitive Shortfall Rebate High (bps)	0.86	0.38	2.42	0.22
CAT	Competitive Shortfall Rebate Low (bps)	1.31	0.50	3.71	0.46

Source: SEC Order Competition Rule Proposal, Page 268.

Broker Routing Realized Spreads: Magnitudes

Table 19: Total Annual Competitive Shortfall Dollar Values under Different Volume Scenarios

Data Source	Competitive Shortfall Scenario	Segmented Order Volume Scenario: Base (7.80% of Total Executed Dollar Volume)	Low (7.34% of Total Executed Dollar Volume)	High (10.08% of Total Executed Dollar Volume)
Rule 605	Competitive Shortfall Rebate Base (0.58 bps)	$800 million	$753 million	$1.03 billion
Rule 605	Competitive Shortfall Rebate High (0.38 bps)	$530 million	$499 million	$684 million
Rule 605	Competitive Shortfall Rebate Low (0.77 bps)	$1.07 billion	$1.01 billion	$1.38 billion
CAT	Competitive Shortfall Rebate Base (1.08 bps)	$1.50 billion	$1.41 billion	$1.94 billion
CAT	Competitive Shortfall Rebate High (0.86 bps)	$1.20 billion	$1.12 billion	$1.54 billion
CAT	Competitive Shortfall Rebate Low (1.31 bps)	$1.82 billion	$1.71 billion	$2.35 billion

Source: SEC Order Competition Rule Proposal, Page 272.

Summary Comparison of OBO and BR

- Pure common values model ($c_1 = 1$, $c_2 = 0$)
  - As N grows large, winning bid converges to 0 in both OBO and BR
  - This is the Milgrom and Wilson intuition from their seminal work in the late 1970s

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    - BR converges to 0.
    - OBO converges to a negative spread – interpretable as a price better than the midpoint.

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  - Similar message as private values case: BR converges to 0, OBO converges to a negative spread

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- So – even assuming that BR has zero rent, OBO looks better in the most natural cases
- **And if broker-routing has economic rents that auctions eliminate (as auctions do!), then that only amplifies the case for OBO $>$ BR for investors.**

Adding Institutional Investors

- It's great that the model separately considers entry by institutional investors. A case to have in mind might be
  - Number of market makers N might be somewhat small: 5?
  - Number of institutional investors N_0 should be pretty large: 20? 50? 100?

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- Proposition 6: $W_I^{OBO} > W_I^{BR}$ if and only if $\frac{c_2}{c_1} > \frac{\frac{1}{(N+N_0)(1+N+N_0)} - \frac{p_0(2-p_0)}{N(N+1)}}{\frac{N+N_0-3}{2(N+N_0+1)} - \frac{p_0(N-3)}{2(N+1)}}$.
- Let $p_0 = 0$ and this threshold becomes $\frac{c_2}{c_1} > \frac{2}{(N+N_0)(N+N_0-3)}$. If...
  - $N = 5, N_0 = 20$, this is $\frac{c_2}{c_1} > .004$.
  - $N = 5, N_0 = 50$, this is $\frac{c_2}{c_1} > .0007$.
  - $N = 5, N_0 = 100$, this is $\frac{c_2}{c_1} > .0002$.

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  - $N = 5, N_0 = 100$, this is $\frac{c_2}{c_1} > .0002$.
- So even a tiny amount of private-values is enough to tip the scales in favor of OBO. And again, that's without any rent in broker routing!

Magnitudes, Political Economy of

- It's worth remembering, since this analysis assumes away any economic rent in the status quo — for the brokers or the market makers — what the rent is
  - PFOF is a few $bn per year
  - Wholesaler rents are $<$1bps on volume (SEC filing analysis)

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- So ... we are fighting about on the order of a basis point.
- This is a classic concentrated vs. dispersed interests problem, in the spirit of Mancur Olson ("The Logic of Collective Action", 1971)
  - If you are one of the parties sharing a piece of the pie, that's a great business
  - Whereas the beneficiaries of improving the market are very dispersed

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- You can see this concentrated-dispersed dynamic play out in the diversity of comment letters on the Order Competition Rule

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  - And then another surprisingly large set of comment letters that says PFOF is a vast conspiracy — perhaps because it's kind of hard to get worked up over a basis point otherwise
- But the fact is, basis points add up to real money, and the regulator's job is to work on behalf of dispersed interests not the concentrated ones.
- So I commend the SEC for its proposal, and that's why I wrote in support of it.