

Competition for Order Flow and Smart Routers

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Background and Motivation

- Automation changes organization of financial markets \implies Proliferation of new marketplaces \implies Renewed concerns (Reg-NMS, MiFID)
 - SEC release n34 – 42450 (2000):
 - * *“To what extent is fragmentation . . . a problem in today’s markets? For example, has fragmentation isolated orders . . . reducing liquidity?”*
 - * *“Will the greater potential provided by advancing technology for the development of broker order-by-order routing systems . . . address fragmentation problems without the need for Commission action?”*
 - MiFID, p.1, art 5:
 - * *“It is necessary . . . to ensure a **high quality of execution** . . . new generation of organized trading systems, which should be subjected to obligations . . .”*

Solution: A Centralized Limit Order Book?

- **Proposal:** A centralized limit order book (CLOB) with strict price and time priority.
- **Very Controversial:**
 1. **Advocates:**
 - (a) Improves liquidity by pooling orders in the same market (market externalities).
 - (b) The search for best execution is simplified.
 2. **Opponents:**
 - (a) Stifles inter-market competition.
 - (b) Not needed: with automation of the routing decision, everything is as if order flow was centralized.

Example

Market A		Market B		Consolidated Market	
ask	#shares	ask	#shares	ask	#shares
23	250	23	250	23	500
22	800	22	800	22	1,600
21	500	21	500	21	1,000

- **Question:** Is consolidated depth at a given price smaller, larger, or identical in a CLOB compared to the multiple markets environment?

Literature

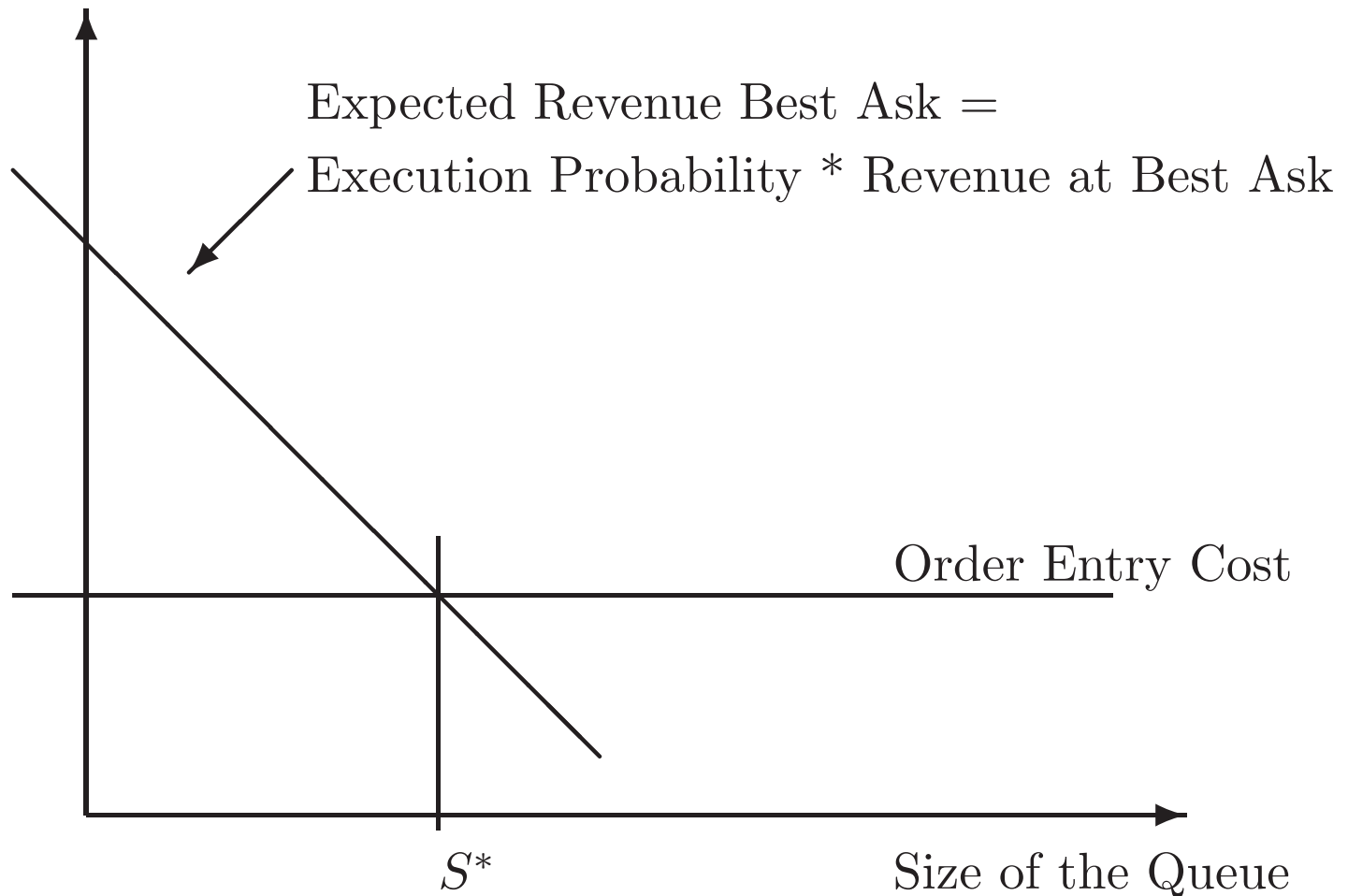
- **Theory:**

1. Pagano (1989), Admati and Pfleiderer (1988), Glosten (1994), (1998), Biais, Martimort and Rochet (2000), Hendershott and Mendelson (2000), Parlour and Seppi (2003), Viswanathan and Wang (2002).
2. **Our analysis is mainly related to Parlour and Seppi (2003) and Glosten (1998).**

- **Empirical Analyses:**

1. Vast empirical literature on the effects of competition between markets and fragmentation (e.g. Battalio (1997), Mayhew (2003), Biais, Bisière and Spatt (2005), Harris and Mayhew (2005), Hendershott and Jones (2005),...).
2. **No analysis of competition between pure limit order markets.**

Economics of Limit Order Submission

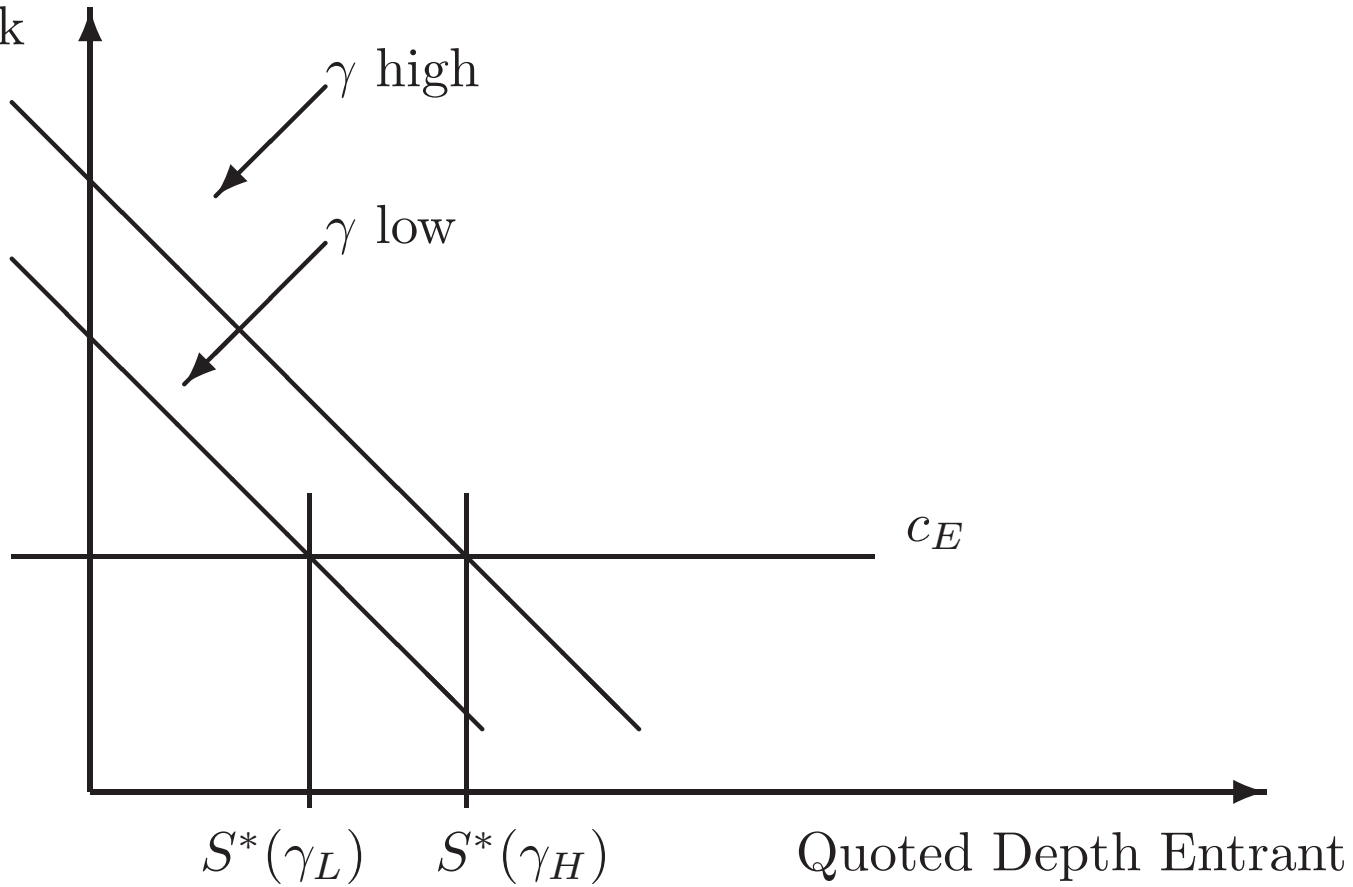


CLOB vs Fragmented Market

- Entrant markets (e.g. ECNs, EuroSETS) often charge relatively small fees on passive orders. Is this sufficient for steering away passive order flow from the incumbent market?
- **No:** the two markets co-exist when $c_E^{**} < c_E \leq c_I$.
- **The result is improved liquidity, why?**
 1. **Queue-jumping:** As the book fills in the low cost market, the execution probability in this market declines. At some point, it is optimal to switch to the high cost market to jump the queue.
 2. **Lower fees:** The “average” fee for submitting a passive order drops if the entrant market charges lower fees.

Effect of Smart Routers

Expected
Revenue
Best Ask



Testable Implications

The model leads to the following predictions:

- **H.1** Consolidated depth is larger after EuroSETS entry.
- **H.2** Bid-ask spreads in the consolidated market are unchanged or smaller after entry.
- **H.3** An increase in the proportion of smart routers increases EuroSETS relative liquidity: (i) EuroSETS' contribution to quoted depth and (ii) the ratio of NSC quoted spread to EuroSETS quoted spread.

The “Dutch Market Experiment”

- On May 24, 2004, the LSE starts trading Dutch securities through a local system, similar to the Euronext system:
 1. Pure limit order markets with identical trading rules
 2. Same clearing and settlement system
 3. Same location and same pool of potential users
- **Fees:** Difficult to compare (as, to some extent, broker dependent), but:
 1. EuroSETS is clearly more competitive on passive orders (no order entry fee + rebates in case of execution).
 2. NSC appears more competitive on aggressive orders (at least for sufficiently large orders).
 3. NSC reduced its fees (on both aggressive and passive orders) just before EuroSETS entry.

Data

- Snapshots of EuroSETS and NSC every 5 minutes (up to the 5 best quotes on each side of the book) before and after the entry of EuroSETS for 22 stocks, all constituents of the AEX index (very actively traded stocks).
- **We focus on 3 periods (21 trading days in each period):**
 1. **Pre-entry period:** April 23—May 21, 2004.
 2. **Post-entry period 1:** August 2—August 30, 2004.
 3. **Post-entry period 2:** January 3—January 31, 2005.
- We group our sample stocks in quartiles based on 2003 volume (Q1, Q2, Q3, Q4). Stocks in Q1 are the most active (more than 4,500 trades per day on average).

Market Shares

We calculate volume in pre- and post-entry periods:

		Pre-Entry	Post-Entry 1		Post-Entry 2	
			Consoli- dated	%-age LSE	Consoli- dated	%-age LSE
Daily volume ^a (euro mio)	Q1	167.33				
	Q2	57.12				
	Q3	25.29				
	Q4	9.40				
	All	69.10				

^a: The trade statistics are based on all trades through the limit order book, i.e. off-market block trades are not included.

Market Shares

We calculate volume in pre- and post-entry periods:

		Pre-Entry	Post-Entry 1		Post-Entry 2	
			Consoli- dated	%-age LSE	Consoli- dated	%-age LSE
Daily volume ^a (euro mio)	Q1	167.33	147.36	5.1%	176.03	3.6%
	Q2	57.12	48.85	0.3%	58.07	0.2%
	Q3	25.29	19.43	0.3%	25.85	0.1%
	Q4	9.40	9.25	0.2%	9.26	0.0%
	All	69.10	60.03	3.5%	71.82	2.4%

^a: The trade statistics are based on all trades through the limit order book, i.e. off-market block trades are not included.

Change in Liquidity due to LSE Entry, P-E 1

We isolate the change due to LSE entry by adding the control variables (i) volume, (ii) volatility, and (iii) price.

	Spread (basispoints)	Depth0 (in €100,000)	Depth4 (in €100,000)
Q1	-1.16* (-4.77)	-15%	
Q2	-0.28 (-1.04)	-2%	
Q3	3.49 (1.18)	16%	
Q4	3.11 (1.68)	7%	

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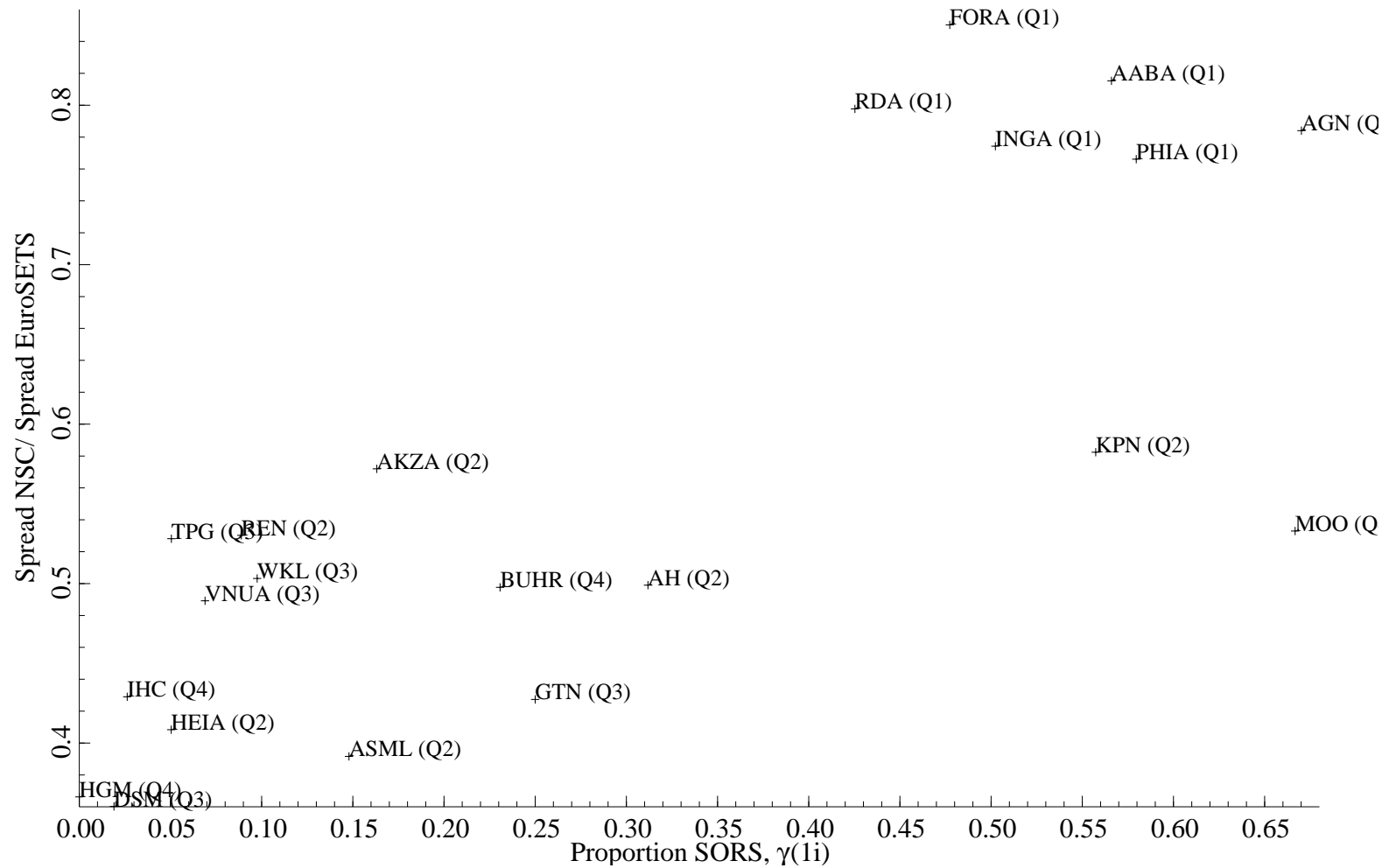
	Spread (basispoints)		Depth0 (in €100,000)		Depth4 (in €100,000)	
Q1	-1.16*	-15%	0.56*	46%	6.00*	78%
	(-4.77)		(4.71)		(12.58)	
Q2	-0.28	-2%	0.65*	48%	5.12*	66%
	(-1.04)		(2.70)		(4.56)	
Q3	3.49	16%	0.33	35%	2.92*	50%
	(1.18)		(1.91)		(3.05)	
Q4	3.11	7%	0.57	50%	2.90*	35%
	(1.68)		(2.94)		(4.10)	

Proportion of Smart Routers (γ), P-E 1

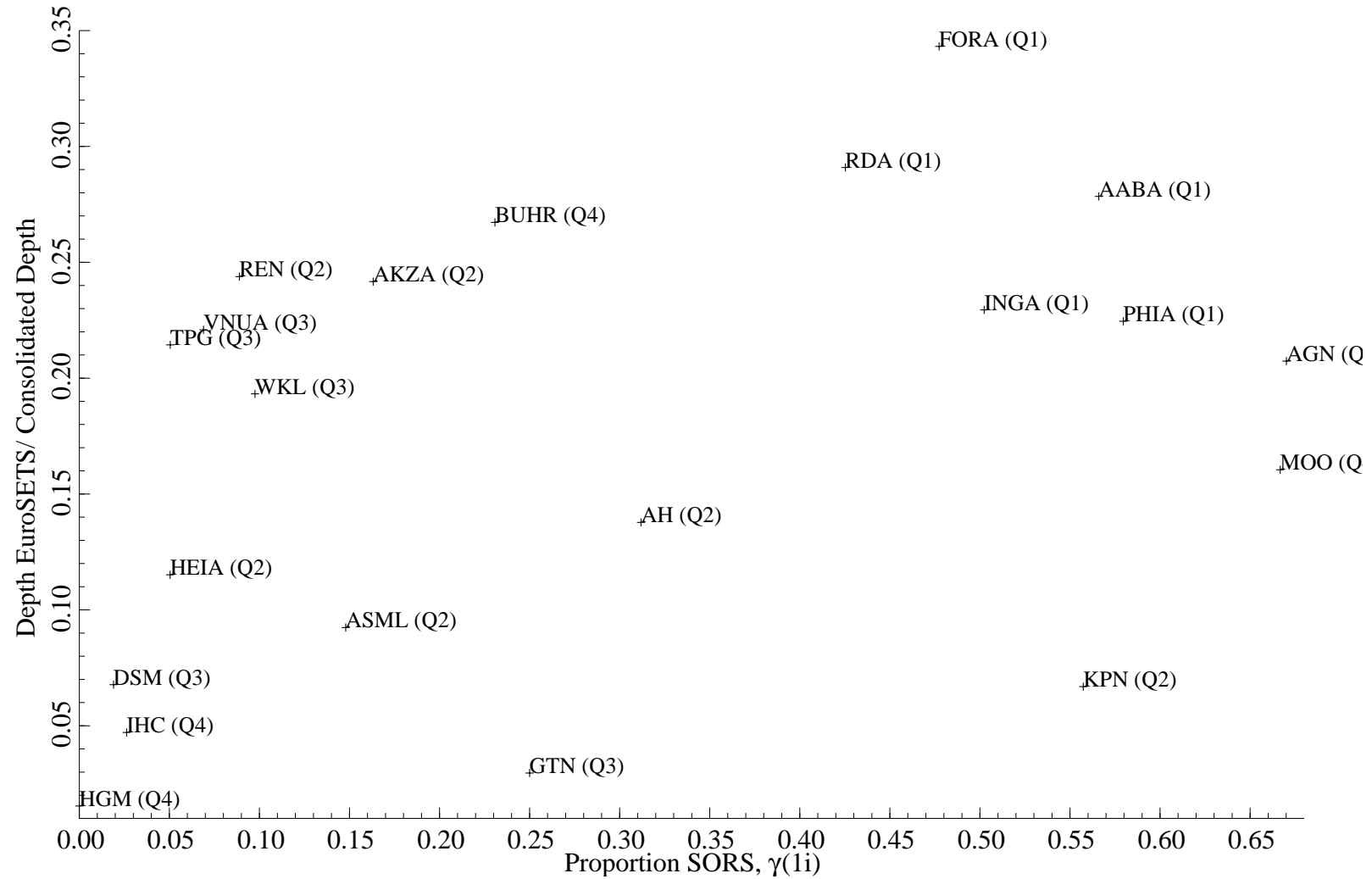
We estimate the proportion of smart routers, based on the proportion of trade-throughs at times when EuroSETS shows strictly better prices:

	$\hat{\gamma}_1$	$\hat{\gamma}_2$
Q1	54%	37%
Q2	22%	15%
Q3	10%	5%
Q4	23%	19%
All	27%	19%

Spread Ratio against γ , P-E 1



Depth Ratio against γ , P-E 1



Regressions

Cross-sectional regressions yield:

Variable	Spread Ratio		Depth Ratio	
	P-E 1	P-E 2	P-E 1	P-E 2
$\hat{\gamma}_1$	0.393*	1.012*	0.093	0.203*
Volume	0.001*	0.000	0.000	0.000
Annualized Volatility	-0.004	0.003	-0.004	-0.002
R^2	0.77	0.89	0.34	0.68

*: Statistically significant at 5%.

Where to Start on Equal Prices? P-E 1

We estimate the probability that traders start to execute in the incumbent market when prices are equal in both markets. We refer to this the “tie-breaking rule” parameter δ_I :

		Q1	Q2	Q3	Q4	All
P-E 1	$\hat{\delta}_I$	0.954	0.988	0.991	0.989	0.981
	$\sigma(\hat{\delta}_I)$	0.001	0.003	0.007	0.009	0.003
P-E 2	$\hat{\delta}_I$	0.964	0.834	0.630	0.710	0.784
	$\sigma(\hat{\delta}_I)$	0.001	0.035	0.148	0.384	0.103

Why the Low EuroSETS Market Share?

After all analyses, we claim that the key reasons for the low market share are:

1. Brokers have not yet automated the routing decision fully. This explains the high trade-through rate.
2. Yet, we find considerable liquidity supply in EuroSETS due to subsidized limit order submission.
3. But, on equal prices, brokers prefer to trade on NSC taking into account the fee structure.

Self-fulfilling situation: little incentive for brokers to automate the routing decision. Regulatory action needed?

Monthly Loss non-SORS Traders

We identify sub-optimal trades and establish a lower bound on loss for non-SORS traders:

	Q1	Q2	Q3	Q4	All
P-E 1 # Trade-Through Orders					
Fraction of Total					
Monthly Loss (€1,000)					
Monthly Net Loss (€1,000)					
P-E 2 # Trade-Through Orders					
Fraction of Total					
Monthly Loss (€1,000)					
Monthly Net Loss (€1,000)					

Monthly Loss non-SORS Traders

We identify sub-optimal trades and establish a lower bound on loss for non-SORS traders:

	Q1	Q2	Q3	Q4	All
P-E 1 # Trade-Through Orders	16,374	1,172	769	185	18,500
Fraction of Total	0.07	0.01	0.01	0.01	0.04
Monthly Loss (€1,000)	313	39	24	8	385
Monthly Net Loss (€1,000)	271	37	23	8	338
P-E 2 # Trade-Through Orders	10,691	657	514	212	12,074
Fraction of Total	0.04	0.01	0.01	0.01	0.02
Monthly Loss (€1,000)	172	17	11	9	208
Monthly Net Loss (€1,000)	143	16	10	9	177

Money at Stake?

Violation of best execution is a critical factor in explaining the low EuroSETS market share. How much money is at stake?

- Cost of sub-optimal execution (“Dutch experiment”): **€4 mln**
- Fee reduction limit order submission (Euronext cash market):
 $12 * 13.5 \text{mln} * \text{€}0.30 / 0.5 \approx \text{€}100 \text{ mln}$
- Bid-ask spread reduction (Euronext cash market):
 $15\% * 12 * 13.5 \text{mln} * \text{€}0.02 * 2,000 \approx \text{€}1 \text{ bln}$

Conclusions and Future Research

- **Our theoretical and empirical findings indicate that:**
 1. Competition between pure limit order books results in a more liquid environment than centralization of order flow in a single market.
 2. The viability and competitiveness of fledging markets is determined by the proportion of smart routers.
 3. Order flow does not necessarily concentrate in the market charging the smallest fee on passive orders.
- Empirical findings also indicate that violations of price priority (“trade-throughs”) do frequently occur \implies small proportion of smart routers.
- Why? Are gains from optimal routing too small compared to costs of developing smart routers or costs of manually splitting orders?

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