

Competition for liquidity, Trading Fees and the Make/Take Decision

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AMF Scientific Advisory Board Conference

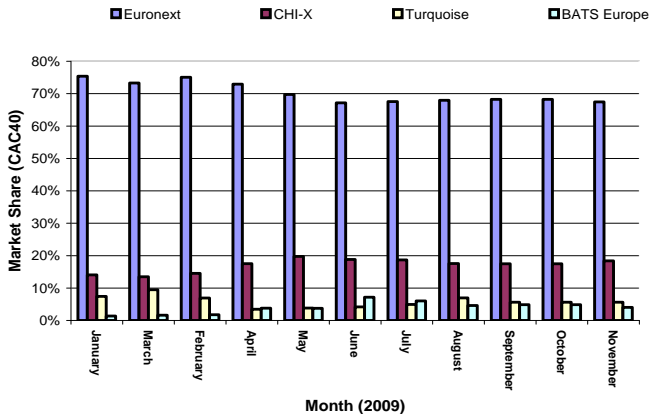
Plan

1. **Introduction**
2. **Model**
3. **Findings for given trading fees**
4. **Optimal fees with a single trading platform**
5. **Optimal fees with competing trading platforms**
6. **Is competition among markets good for investors?**

Background

- ▶ **Important changes in the industrial organization of equities markets both in Europe and in the U.S.:**
 1. Widespread adoption of limit order markets (LOMs)
 2. Entry of new platforms (BATS, Chi-X, Turquoise, EdgeX etc...).
 3. \implies Increased competition for order flow and "price wars" among trading platforms.

Loss in market shares



► Source: Thomson-Reuters

New business models

- ▶ **Competition on total trading fee and make/take fees.**

	<i>Make Fee</i>	<i>Take Fee</i>	Total Fees
NYSEArca	-23	30	7
BATS	-24	25	1
EDGX	-25	30	5
Nasdaq	-20	30	10

Source: Traders' Magazine, Aug 2009 (in cents/1000 shares)-Tape A

- ▶ **"Fee Structure" = "Pricing Model"**

New regulatory questions

- ▶ **CESR, April 1st 2010: "Micro-structural issues of the European equity markets"**
 1. *"What are the impacts of current fee structures on trading platforms, participants, their trading strategies and the wider market and its efficiency?"*
 2. *"Is there a role for regulators to play in the fee structures?"*

What do we know on these questions?

- ▶ **Not much...**
- ▶ **Theories of competition for order flow:** Pagano (1989), Glosten (1994), Hendershott and Mendelson (2000), Parlour and Seppi (2007), Foucault and Menkveld (2008) etc...
 1. Focus on the "demand side" for trading services (investors' order placement strategies).
 2. Taking "the supply side" (that is, platforms' pricing strategies) as given.
 3. And do not consider how trading fees affect the make/take decision and investors' welfare.
- ▶ **Do trading fees matter for liquidity? For welfare? Why?**

Simple answer?

- ▶ **Trading fee= Price of finding a counterparty:**
 1. You increase this price \implies You decrease the demand for trading
 2. Fewer profitable matches happen \implies Welfare goes down
- ▶ **Is this that simple?**
 1. Execution probabilities (likelihood of a match) also matters for welfare in limit order markets (see empirical analysis by Hollifield et al.(2006)).
 2. Do larger trading fees always lead investors to submit limit orders with *smaller* execution probabilities?

Our objectives

- ▶ **Provide a model of competition for order flow in which both order placement strategies** (routing decisions and limit/market order choices) **AND trading platforms' strategies are endogenous.**
- ▶ **Use the model to analyze:**
 1. The effects of trading fees on measures of market liquidity (bid-ask spreads, limit order fill rates, trading rates) and welfare.
 2. The determinants of trading platforms' optimal pricing strategies.
 3. The effect of inter-market competition on trading fees and investors' strategies.
- ▶ **Important to identify whether and where regulatory intervention is required.**

Main insights from the model

- ▶ **A higher trading fee can be a way to induce "makers" to post limit orders with higher fill rates** (it is a way to reduce makers' market power) \implies
 1. Counter-intuitive effects of trading fees on trading volume and investors' welfare.
 2. There can be (but not always!) too much competition (i.e., entry of a new LOM or too aggressive pricing in one venue) can reduce investors' welfare.
- ▶ **In absence of "frictions," the total trading fee matters more than its breakdown between makers and takers:**
 1. \implies Investors' welfare and platforms' market shares only depend on the total fee, not the make/take fee breakdown.
 2. Two LOMs with different fee structures can coexist, provided their total fee is identical

Plan

1. **Introduction**
2. **Model**

Model

- ▶ **The market for a riskless security that pays a single cash-flow v_0 at a random date \tilde{T} .**
- ▶ **Populated by buyers and sellers who arrive sequentially in the market to trade one share of the security**
 1. **Buyers: high valuation for the security:** $v_H = v_0 + L$
 2. **Sellers: low valuation for the security:** $v_L = v_0 - L$
- ▶ **Investors value execution speed:** they discount the payoff of "delayed execution."
 1. Patient investors' discount factor: $\delta_H \leq 1$
 2. Impatient investors' discount factor: $\delta_L < \delta_H$.
- ▶ **All investors have a deadline of one period to execute their trades.**

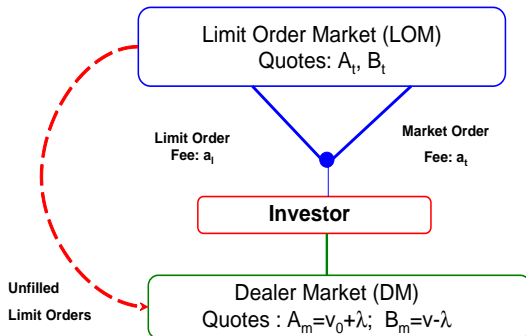
Investors' types

- ▶ 4 possible types of investors:

	Buyer	Seller	Fraction
Patient	$\pi/2$	$\pi/2$	π
Impatient	$(1 - \pi)/2$	$(1 - \pi)/2$	$(1 - \pi)$
Fraction	$\frac{1}{2}$	$\frac{1}{2}$	

Market structure

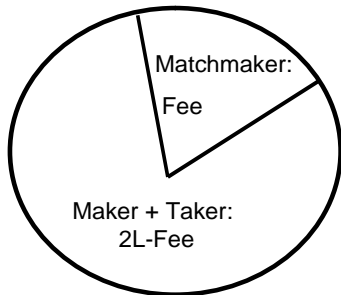
Figure 1



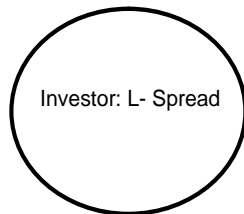
- ▶ **Dealer market = Outside Option + Market of last resort.**

Gains from trade

▶ Limit order market



▶ Dealer market



- ▶ Important: Gains from trade LOM/Gains DM $\searrow \implies$
 Makers' market power \searrow

Sources of inefficiencies

- ▶ **Welfare: Sum of buyers and sellers' expected profit** before they learn (i) their type (patient/impatient) and (ii) the state of the market when they arrive.
- ▶ Maximum welfare: $2L$.
- ▶ **Smaller in equilibrium because:**
 1. **Limit orders do not execute with probability one** \implies welfare loss since (i) investors like speedy execution and (ii) the dealer market is a less efficient matching technology.
 2. **Impatient investors may sometimes submit limit orders** \implies welfare loss since they suffer more from delayed execution.
 3. **Impatient investors may trade in the dealer market upon arrival** \implies welfare loss since the dealer market is a less efficient matching technology.
 4. **Fee paid to the matchmaker.**
- ▶ **Problem:** Lowering the fee can make other inefficiencies larger.

Timing

1. The matchmaker sets its total fee and the make/take fee breakdown
 2. Investors choose their order placement strategies given the trading fees set in step 1.
- **We solve the game backward:**
1. We first analyze the equilibrium order placement strategies for fixed fees
 2. We solve for the matchmaker's optimal fees, taking into account their impact on investors' order placement strategies

How does the model work?

► **Trade-offs for investors:**

	Price	Speed	Opp. Cost
Limit Order	+	-	High
Mkt Order	-	+	0
Contact Dealer	-	+	0

Four possible liquidity regimes in equilibrium

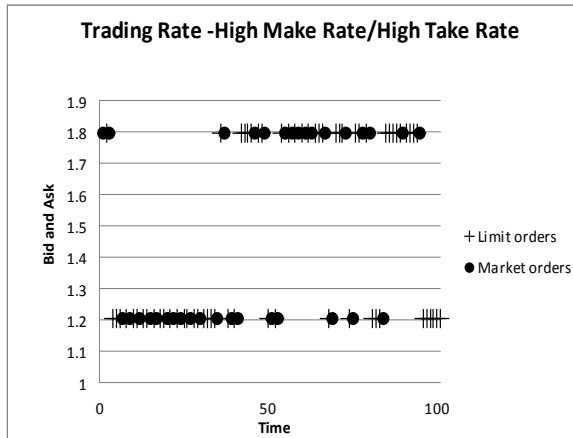
	High Make Rate	Low Make Rate
High Fill Rate	Takers: All	Takers: All
	Makers: All	Makers: Patient only
Low Fill Rate	Takers: Impatient only	Takers: Impatient only
	Makers: All	Makers: Patient only

- ▶ In equilibrium,

$$\text{Trading Rate} = \text{Make Rate} \times \text{Fill Rate},$$

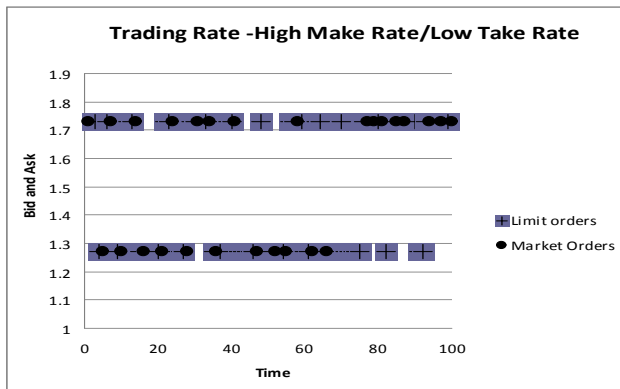
where **Trading rate**=likelihood of a trade per period on the **LOM** ("average number of trades per period").

Regime 1: High Make Rate/High Fill Rate



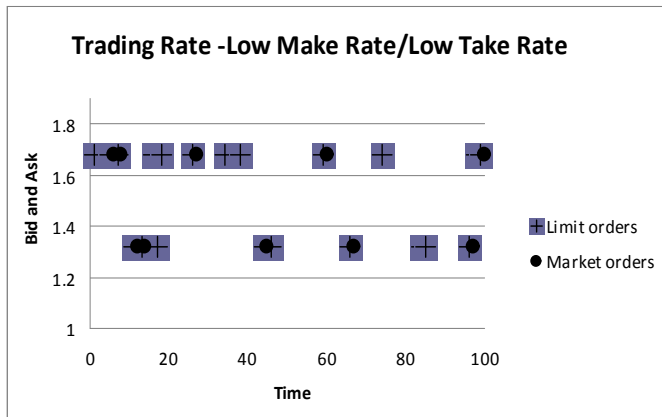
► Trading Rate = 33%

Regime 2: High Make Rate/Low Fill Rate



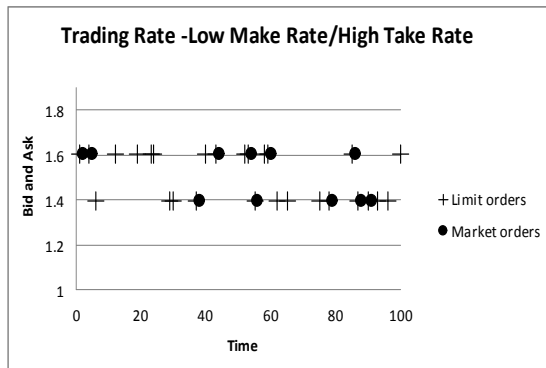
► Trading Rate = 28%

Regime 3: Low Make Rate/Low Fill Rate



► **Trading Rate = 8%**

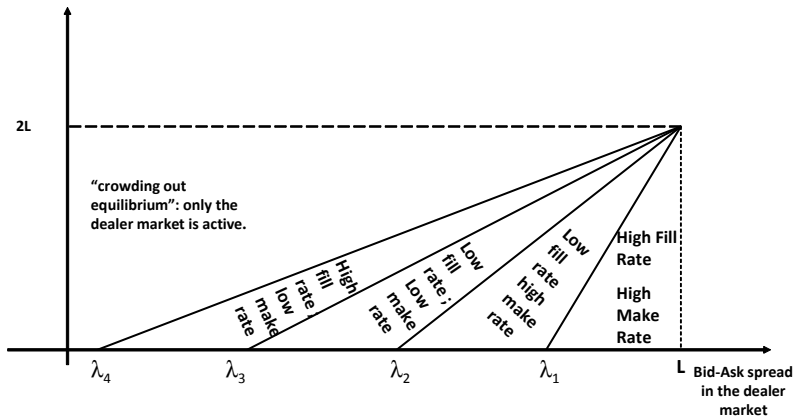
Regime 4: Low Make Rate/High Fill Rate



► **Trading Rate = 9%**

Liquidity regimes and trading fees

Trading fee on the limit order market



Trading Rate and Trading Fee

- ▶ $R = \text{Matchmaker's fee/Dealer Spread}$ (ex: $\pi = 0.2$)

R	Make Rate (1)	Fill Rate (2)	Trading Rate ((1)*(2))
Low	High (66%)	High (50%)	High (33%)
Medium	Very High (71%)	Low (40%)	Medium (28%)
Medium High	Low (20%)	Low (40%)	Very Low (8%)
High	Very Low (18%)	High (50%)	Low (9%)

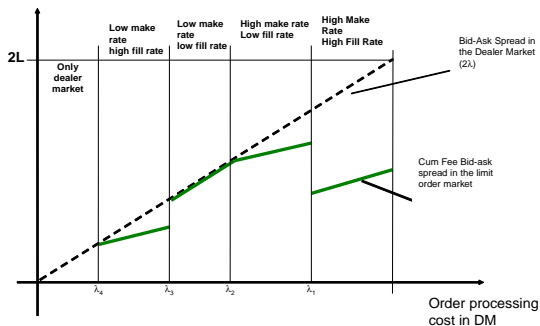
- ▶ **Implication 4:** Trading rate on the LOM is not always decreasing in the fee charged by the matchmaker
- ▶ **Why?** An increase in the total fee can lead makers to make offers with a higher execution probability.
- ▶ \implies **Regulating the total fee is "tricky"....May affect investors' welfare in wrong direction (see below).**

Plan

1. **Introduction**
2. **Model**
3. **Bid-ask spreads and fees**

Competition between makers and dealers

- ▶ **Traded Spread: $A^* - B^*$; Cum fee bid-ask spread: Traded Spread + 2*Take Fee = True Cost of Trading**



Competitive liquidity spillovers

- ▶ **Implication 1: For a fixed filled rate (regime), an increase in the liquidity of the dealer market makes the limit order market more liquid.**
- ▶ **Intuition: "makers" in the LOM compete with dealers.**
 1. The "outside option" of new investors in the market (a trade in the dealer market or a limit order) is more attractive when the cost of trading in the dealer market is lower.
 2. \Rightarrow Investors who chooses to submit a limit order have less market power.
 3. \implies Bid-ask spread is tighter in the limit order market.
- ▶ But unimportant for welfare in a given regime. Only the trading rate on the platform matters for welfare.

Trading fees and bid-ask spread

► **Implication 2: In a given regime:**

	Traded spread	Cum fee spread
Take Fee ↗	↘ (not one for one)	↗
Make Fee ↗	↗ (not one for one)	↗
Total Fee ↗	Depends	↗
Take Fee ↗ - Make Fee ↘ - Total →	↘	Unchanged

- **⇒ Liquidity rebates combined with high takes fees are a powerful tool to make traded spreads small... "prices look good"**

Do investors care about the fee structure?

- ▶ **Implication 3: The fee structure does not affect how gains from trade are divided between makers and takers.**
- ▶ **Consider a decrease by one cent in the make fee "neutralized" by an increase of one cent in the take fee.**
 1. Other things equal, submitting a limit order is more attractive \implies Fewer investors choose to be takers (investors switch "side")
 2. \implies Fill rates fall
 3. \implies Investors submitting limit orders post more aggressive quotes until fill rates revert to their initial levels
 4. \implies Quotes cum fees are unchanged...
 5. \implies Division of gains from trade are unchanged...

When does the fee structure matter?

- ▶ **The total fee is more important than the fee structure for market quality in this model.**
- ▶ **Three important assumptions behind this "irrelevance" result:**
 1. **Routing decisions are based on cum fee prices, not raw prices** (important for trade-through regulations)
 2. **Investors switch in an opportunistic way from market to limit orders**
 3. **All quotes are feasible (tick size = 0)**
- ▶ **Conjecture:** If one of these assumptions does not hold, the fee structure affects the equilibrium outcome.

Plan

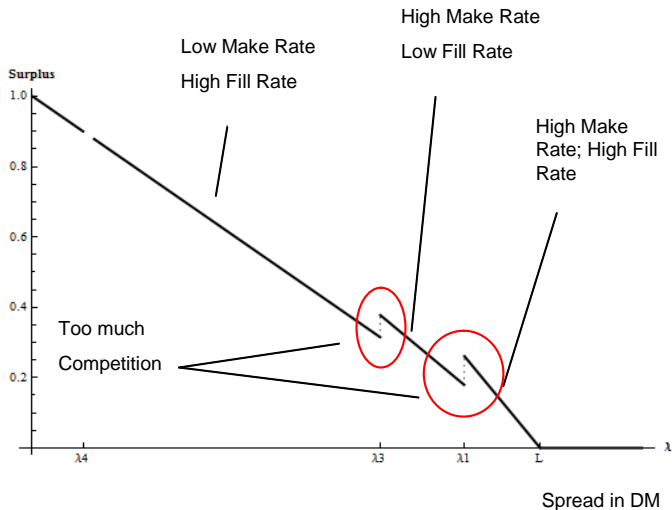
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3. **Bid-ask spreads, trading rate and fees**
4. **Optimal fees with a single trading platform**

Numerical Example

	Spread in Dealer Market				
	λ				
	1	0.95	0.7	0.5	0.2
Matchmaker's Fee	2	1.7	0.65	0.75	0
Cum Fee Spread	2	1.8	1.4	1	0.4
Trading Rate	33%	33%	28%	9%	9%
Fill Rate	50%	50%	40%	50%	50%
Matchmaker's profit	0.66	0.561	0.185	0.0675	0
Investors' Welfare	0	0.08	0.336	0.5	0.8

- ▶ **Parameter values:** $\pi = 20\%$; $\delta_H = 0.8$; $\delta_L = 0.5$; $L = 1$
- ▶ $H (L)$: High (Low) Make Rate; $h (l)$: high (low) Fill Rate.

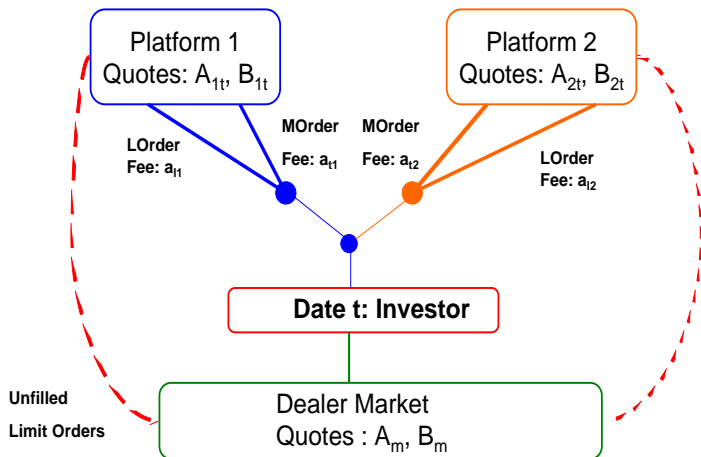
Is competition among markets good for investors?



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5. **Optimal fees with competing platforms?**

Competition between platforms



- **Important:** No captive clientele; No cost of observing quotes in each platform.

Findings

- ▶ **The platforms coexist (both attracts trades) if they have the same total fee** ($a_{l1} + a_{m1} = a_{l2} + a_{m2}$). Otherwise the platform with the smallest total fee attracts all trading.
- ▶ Whether the platforms coexist or not, the equilibrium for fixed fees has the same properties as in the single platform case.
- ▶ **Competition drives the total fee to zero.**
- ▶ **Conclusion: The breakdown of fees is irrelevant.** Both trading platforms can display very different fee structures and still coexist. Only the total fee matters.

Intuition

- ▶ Suppose that initially both platforms charge a uniform fee on makers and takers and platform 1 moves to a maker/taker model **while keeping its total fee unchanged**.
 1. \implies **Other things equal**, Platform 1 becomes more attractive for makers but less for takers.
 2. \implies Investors desert platform 2 and **switch to being makers on platform 1**
 3. \implies Limit order fill rates fall
 4. \implies Makers post more attractive offers, until the point the cum fee bid-ask spread is as in the original situation.
- ▶ Again, the result is driven by the fact that (i) investors make routing decisions based on cum fee prices and (ii) can switch from market to limit orders and vice versa depending on which order is the cheapest.

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Is competition among markets good for investors?

► **To address this question we consider how investors' welfare change when:**

1. **Scenario 1:** The LOM initially operates alone and a new LOM enters.
2. **Scenario 2:** The LOM initially operates alone and a DM enters
3. **Scenario 3:** The LOM initially coexists with a DM and a new LOM enters.

Is competition among markets good for investors?

▶ **YES in Scenario 1**

1. In absence of competition, the optimal fee for the LOM is such that it extracts all investors' surplus \implies Investors get no surplus.
2. Competition forces the monopolist LOM to decrease its fee \implies Investors' welfare unambiguously increases.

▶ **Most likely Yes in Scenario 2**

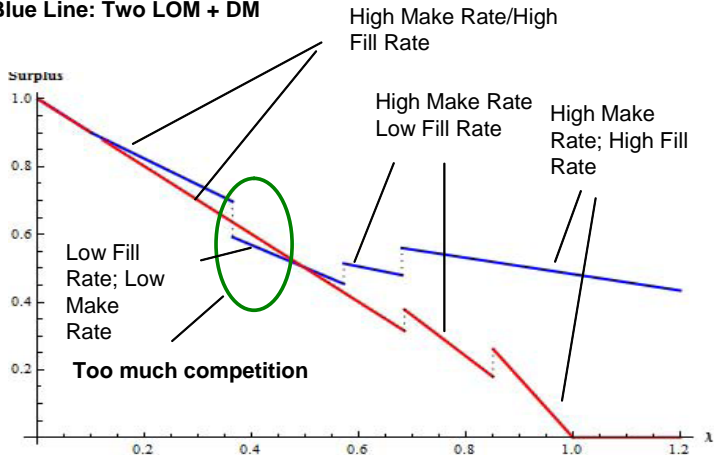
▶ **NOT ALWAYS IN Scenario 3. Why?**

1. The low fill rate/low make rate regime can arise when the total fee is small
2. By charging a sufficiently large fee, a monopolist LOM always avoids this equilibrium.

Numerical Example: Investors' Ex-Ante Expected Profits

Red Line: 1 LOM + 1 DM

Blue Line: Two LOM + DM



Conclusions

▶ **Trading fees matter:**

1. Not only because they determine investor's net gains from trade.
2. Strategic behaviors by investors can result in too little trading and inefficient allocation of "roles."
3. An increase in the total trading fee can alleviate these problems...but it reduces gains from trade for investors → Net effect on welfare is ambiguous.

▶ **Make/take fee breakdown does not matter here because:**

1. No tick size (quotes can adjust freely)
2. Investors care about prices cum fees
3. Investors are not "specialized" (switch from being to takers and vice versa).

▶ **The make/take fee breakdown is likely to matter otherwise (see Foucault, Kandel and Kadan (2009)).**