Lack of Anonymity and the Inference from Order Flow

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Motivation

- The objective of the paper is to contribute to the literature that investigates whether market structure rules that govern trading information are important.
  - Our focus: Information about the identity of investors.
- The concept of “Anonymity” in financial markets pertains to the information market observers have about the identity of investors who submit orders.
  - Anonymous: Majority of Electronic Limit Order Book markets.
  - Intermediate level: ELOB with broker ID; floor markets.
  - Non-anonymous: Upstairs markets.
- Degree of Anonymity is important: Event studies find that liquidity can change when broker ID is introduced or eliminated.
  - Comerton-Forde, Frino, and Mollica (2005), Foucault, Moinas, and Theissen (2007), Aspris, Frino, Gerace, and Lepone (2008).

Motivation – cont.

- Why is broker ID important?
  - Informed investors could use mixed strategies (i.e., trade through multiple brokers) in a manner that makes this signal uninformative.
  - In the absence of frictions in the economic environment, intermediate level of anonymity is irrelevant.
- Our goal: To investigate the information content of signals about the identity of investors and whether they affect price formation in a market with an intermediate level of anonymity.

Data and Sample

- Two sources of data:
  - Finnish Central Securities Depository registry (complete trading records of all Finnish investors).
  - Helsinki Stock Exchange supervisory files (information on every order that is entered into the exchange's system).
- The trading mechanism of the Helsinki Stock Exchange is an electronic limit order book with standard price-time priority rules.
- Key feature: broker IDs are visible.
- Sample period: July 10, 2000 through October 23, 2001.
- Sample: 87 firms (all listed firms with average daily number of trades exceeding five).
  - All 41 brokerage houses that trade these stocks.

Investor Types

- Investors are grouped into three types:
  - Domestic households
  - Foreign investors
  - Domestic institutional investors
- Maintained assumption: Domestic institutions are more informed on average than domestic households (i.e., they possess more pricing-relevant skill or information about the stocks).
  - Results on foreigners are documented as stylized facts rather than used to test hypotheses about anonymity.

Broker Assignment Rule

- A broker belongs to a Broker Group (BG) that is associated with a certain investor type if more than 50% of the trades that the broker executes involve this investor type.
  - BG1 associated with households, BG2 associated with foreigners, BG3 associated with domestic institutions.
- We test the pricing implications of inference from broker identities, not how prices respond to the trading of particular investor types.

	Broker Group	**Investor Category**		
		Households	Foreigners	Domestic Institutions
Number of Trades	BG1	72.3%	6.9%	20.8%
	BG2	3.7%	79.1%	17.2%
	BG3	11.5%	16.9%	71.6%

Do Informed Investors “Hide”?

- Absence of frictions associated with broker selection, informed investors would want to use mixed strategies across the different brokers to “hide” their order flow.

Definition of Multi-Broker User	**Households**		**Domestic Institutions**	
	Investors	Trades	Investors	Trades
Multiple Brokers, Any Stock, Same Day	9.1%	20.7%	11.5%	81.0%
Multiple Broker Groups, Same Stock, Same Week	1.6%	6.6%	3.8%	55.1%

- Majority of institutional trading comes from multi-broker users!
  - Consistent with informed institutions that are aware of the information content of their order flow and attempt to “hide.”

Inference about Investor Types

- Is there still an information content to broker ID?
- Probit regressions (pooled; stock fixed-effects).
  - Dependent variable in the Households regression:
    - » 1=if a household submits a marketable order, 0=otherwise.
  - Controls: recent activity (volume, signed return, volatility, duration), prevailing state of the limit order book (BBO depth; spread) and trade size (trade size; size-relative-to-depth).

		Households		**Foreigners**		**Domestic Institutions**	
BG1	Coef.	0.2123**	0.3038**	-1.3568**	-1.0345**	-0.4896**	-0.2396**
	t-stat.	(21.29)	(29.84)	(-120.07)	(-85.71)	(-54.41)	(-25.02)
BG2	Coef.	-2.1319**	-1.7174**	0.8487**	1.0291**	-0.7838**	-0.7434**
	t-stat.	(-204.92)	(-160.43)	(74.88)	(85.70)	(-85.77)	(-77.57)
BG3	Coef.	-1.5413**	-1.0784**	-0.9872**	-0.8018**	0.8795**	0.9514**
	t-stat.	(-143.85)	(-97.96)	(-85.31)	(-65.58)	(93.79)	(96.85)
Controls:		No	Yes	No	Yes	No	Yes

Inference about Investor Types–cont.

- How much information is there in broker ID?
  - When broker group dummies are added to the regressions, the pseudo-R^2 increases:
    - » Households regression: from 25.06% to 43.95%
    - » Foreigners regression: from 5.66% to 30.45%
    - » Institutions regressions: from 2.58% to 15.77%
- Result: Broker ID can be used by market participants to significantly increase their ability to infer who (in terms of investor types) is behind initiated trades.
  - It provides an informative signal even though the majority of trading comes from multi-broker users.

Permanent Price Impact

- Is broker ID information meaningful enough to affect price formation in the market?
- The Permanent Price Impact of a trade measures price adjustment from an instant before the arrival of the marketable order to a time where we assume prices have finished their adjustment to the information content of the order.
- We use the signed log change in the midquote from an instant before the trade to five minutes after the trade.
  - Results robust to using other definitions of permanent price impact.
  - We subtract the average price impact in the same stock for marketable orders in the same direction.

Information Asymmetry Groups

- Result 1: Prices adjust more to marketable orders from brokers associated with better-informed investors.
- Result 2: Degree of information asymmetry affects price adjustment for orders coming through brokers associated with informed investors, but not for orders from brokers associated with uninformed investors.

Broker Group	**Bid-Ask Spread Quartiles**				
	Q1(smallest)	Q2	Q3	Q4 (largest)	$t\text{-test}_{(Q4-Q1)}$
BG1	-0.069	-0.052	-0.070	-0.069	-0.1
BG2	0.017	0.117	0.198	0.196	7.8
BG3	0.031	0.134	0.218	0.282	11.2
$t\text{-test}_{(BG1-BG2)}$	-72.8	-33.0	-25.1	-10.8	
$t\text{-test}_{(BG1-BG3)}$	-59.7	-26.7	-24.6	-14.6	
$t\text{-test}_{(BG2-BG3)}$	-10.1	-2.1	-1.3	-2.7	
t-test	$BG1_{(Q4-Q1)}\text{-}BG2_{(Q4-Q1)} = -7.3$				
t-test	$BG1_{(Q4-Q1)}\text{-}BG3_{(Q4-Q1)} = -10.4$				
t-test	$BG2_{(Q4-Q1)}\text{-}BG3_{(Q4-Q1)} = -2.2$				

Permanent Price Impact Regressions

- This is where we try to hold everything else equal and see whether otherwise-identical trades have larger permanent price impacts when they come through a broker that is associated with better informed investors.
- Pooled regressions with stock fixed-effects.
  - Orders coming from BG1 brokers serve as the (unreported) stock-specific intercept.

$$\begin{aligned}\text{ppi}_{i,t} = {} & a_i \text{StockDummies}_{i,t} + b_1 \text{BG2}_{i,t} + b_2 \text{BG3}_{i,t} + b_3 \text{Volume}_{i,t} + b_4 \text{SgnReturn}_{i,t} + \\ & + b_5 \text{Volatility}_{i,t} + b_6 \text{TradeSize}_{i,t} + b_7 \text{TradeSize}^2_{i,t} + b_8 \text{SameSideDepth}_{i,t} + \\ & b_9 \text{OtherSideDepth}_{i,t} + b_{10} \text{FirstTrade}_{i,t} + b_{11} \text{Duration}_{i,t} + b_{12} \text{Duration}^2_{i,t} + \\ & + b_{13} \text{Spread}_{i,t} + b_{14} \text{Spread}^2_{i,t} + b_{15} \text{MarketTrade}_{i,t} + b_{16} \text{LargeTrade}_{i,t} + \varepsilon_{i,t}\end{aligned}$$

PPI Regressions: Results

- Similar results to those in the information asymmetry groups!

		Full Sample	Market Capitalization			
			Q1(small)	Q2	Q3	Q4(large)
BG2	Coef.	0.040**	0.106**	0.055**	0.049**	0.036**
	t-stat.	(23.08)	(5.60)	(7.98)	(9.81)	(21.61)
BG3	Coef.	0.067**	0.126**	0.130**	0.109**	0.049**
	t-stat.	(28.91)	(6.47)	(14.09)	(13.81)	(23.29)
			Bid-Ask Spread			
			Q1(small)	Q2	Q3	Q4(large)
BG2	Coef.		0.044**	0.051**	0.085**	0.011
	t-stat.		(26.85)	(7.82)	(6.76)	(0.40)
BG3	Coef.		0.060**	0.085**	0.159**	0.191**
	t-stat.		(28.19)	(10.07)	(11.76)	(7.17)

Interactions

- There are several interesting interactions that demonstrate the sophisticated manner in which market participants make a joint inference from broker ID and other order attributes.
- Example: Duration
  - Unconditional effect on PPI < 0 (Easley and O'Hara (1992), Dufour and Engle (2000)).
  - BG1 * Duration > 0 (more "noise" trading)
  - BG3 * Duration < 0 (reinforces unconditional effect)

Conclusions

- We show that despite the utilization of multiple brokers by some investors, broker ID can still be used as a powerful signal to help classify orders into “investor types.”
- Implication: There must be frictions in the economic environment that prevent investors from sending orders through multiple brokers.
  - Possible frictions: Heterogeneity in brokerage fees; quantity discounts; bundling of services offered by various brokers (e.g., research; Order Management Systems); “preferred customer” effort level.
- Goldstein, et al. (2009): Bundling in brokerage industry prevents order flow from going to the broker with the lowest commission.
- We: Significant frictions prevent informed investors from migrating to the brokers that would afford them the lowest price impact of trading.

Conclusions – cont.

- We show that signals about the identity of investors (i.e., broker ID) indeed make a difference with respect to market prices.
- Our findings explain why event studies of changes in anonymity show a significant impact on market liquidity.
  - Typical finding is that the removal of broker ID helps liquidity.
  - Our study points to a less favorable interpretation of this result: improved liquidity arises because informed investors are able to hide better and therefore comes at the expense of informational efficiency.
- Current developments in trading technology (e.g., algorithmic trading) should increase the utilization of signals such as broker identity.