Dark Pool Exclusivity Matters

David C. Brown[†]

Co-authored with Leslie Boni[‡] and J. Chris Leach[†]

8th Annual Central Bank Workshop on the Microstructure of Financial Markets

October 25, 2012

† University of Colorado at Boulder

‡ University of New Mexico

The Rise of Dark Pools

- In March 2012, 13% of US equity volume was executed in 54 dark pools (Source: Tabb Group)
- Canadian dark pool volume has grown from 2.2% of market volume to 7% in the last year (Source: Markets Media)
- Dark pools are characterized by a lack of transparency:
  - Pre-trade: Non-displayed orders
  - Post-trade: Trades reported on a venue-anonymous basis
- Dark pools in the US can restrict their trading populations

Equal Access and Market Quality

- There is concern that dark pools create "a two-tiered market in which the public does not have fair access to information about the best available prices and sizes for a stock" (SEC 2009)
- There is a growing academic literature concerned with the impact of dark pools on market quality, e.g. Buti, Rindi and Werner (2010, 2011), Degryse, Van Achter and Wuyts (2009), Kratz and Schöneborn (2010), Nimalendran and Ray (2011), Ready (2010), O'Hara and Ye (2011), Weaver (2011), Ye (2010, 2011), Zhu (2011)

Regulatory Environment

Regulators recognize possible benefits from dark pools and have proposed regulations based on trade size

- SEC (2009): "The proposal (to limit dark pool activities) would exclude IOIs (indications of interest) for $200,000 or more that are communicated only to those who are reasonably believed to represent current contra-side trading interest of equally large size."
- CSA/IIROC (2009): "Dark Pools may decrease the opportunity for information leakage to occur by eliminating intermediaries."
- Earlier this month, new Canadian rules went into effect regulating dark liquidity, but exceptions are permitted for orders of more than C$100,000

Heterogeneity of Dark Pools

Dark pools vary in how they structure trading rules, policies and enforcement in order to attract volume and specific trading populations

- Several dark pools target buy-side institutional investors (e.g., Liquidnet and ITG POSIT).
- NASDAQ OMX Nordic "has overhauled its dark pool to discourage high frequency trading" (Source: The Trade News)
- Barclays now enables dark pool clients to restrict counterparties based on Barclays' classifications of participants "as predatory or benign or somewhere in between." (Source: Traders Magazine)

Research Question

- General Question: Do regulatory restrictions or venue design features make a difference in the trading population and their experiences?
- Specifically, do the benefits and market impacts of trading large blocks in dark pools vary systematically with venue exclusivity?
- The challenge in investigating the role of dark pool design is data availability - dark pools' trades are not differentiated by venue in most data

Summary of Findings

- The exclusive dark pool provides improved large trade execution quality compared to other dark pools
- Differences in execution quality are not due to:
  - Selection bias
  - Correspondingly high unobservable costs at the exclusive venue
- Dark pool exclusivity matters for execution quality, and regulatory exceptions based solely on trade size may not provide desired benefits to institutional traders

Our Exclusive Dark Pool Proxy: Liquidnet Classic

- We use proprietary data from January to March 2011 to identify Liquidnet Classic trades in TAQ data
- Traders enter indications of interest (IOIs), are then notified when a counterparty is present and negotiations take place anonymously within seconds
- Targets buy-side institutional investors who are often thought of as having little tolerance or incentive to engage in gaming by trading opposite of their intended position
- Monitors participants' activity with an aim of mitigating exploitative trading behaviors

Measures of Execution Quality

If dark pools catering to buy-side institutional investors attract a trading population with a lower propensity to engage in gaming, then we expect to observe higher execution quality for trades at exclusive dark pools

We hypothesize that trades at our exclusive dark pool will experience higher execution quality as measured by:

1. Return correlation around large trades
2. Pre-trade abnormal volume and volatility
3. Interday trade clustering

Hypothesis 1: Return Correlation

Traders would like to have minimal market impact when executing large block trades

- Zero correlation is consistent with minimal market impact
- Negative correlation is consistent with mean-reversion in prices, i.e. temporary spikes around large trades
- Positive correlation is consistent with continuing price pressure around large trades

Hypothesis 1: More exclusive trading venues should exhibit smaller magnitudes of serial correlation in returns around large trades

Hypothesis 2: Abnormal Volume and Volatility

Traders would like to have minimal market impact when executing large block trades

- No abnormal volume or volatility prior to a large trade is consistent with minimal market impact
- Volume and volatility increases prior to a large trade are consistent with information leakage and gaming

Hypothesis 2: More exclusive trading venues should exhibit less volume and volatility increase prior to large trade execution

Hypothesis 3: Interday Trade Clustering

Traders will return to venues providing higher quality executions with a higher intensity

- Repeat volume at a trading venue is consistent with satisfactory trade executions for both sides of the trade

Hypothesis 3: More exclusive trading venues should exhibit higher follow-on volume in large trades

Results: Return Correlation

- Hypothesis 1: More exclusive venues should exhibit smaller magnitudes of correlation in returns around large trades
- Empirical Approach: Non-parametric sign and rank-sum tests

Percentage of Trades By Return Correlation		
	Liquidnet Trades	Other Dark Pool Trades
% Negative Correlation	50.6%	52.5%
% Positive Correlation	49.4%	47.5%
Sample Size	2,785	30,424

Results: Volume Increase

- Hypothesis 2: More exclusive trading venues should exhibit less volume increase prior to large trade execution
- Empirical Approach: Non-parametric sign and rank-sum tests

Percentage of Trades By Volume Change

	Liquidnet Trades	Other Dark Pool Trades
% Volume Increase	51.1%	53.5%
% Volume Decrease	48.9%	46.5%
Sample Size	2,480	28,508

- Results are qualitatively similar for volatility increases

Results: Trade Clustering

- Hypothesis 3: More exclusive trading venues should exhibit higher follow-on volume in large trades
- Empirical Approach: Nested Negative Binomial Regression

Change in Expected Number of Venue Trades		
	Liquidnet Trades	Other Dark Pool Trades
1% Increase in First Lag Value	0.68%	0.22%
1% Increase in Second Lag Value	0.43%	0.12%

Alternative Explanation: Selection Bias

- It is possible that trades with higher expected execution quality are more likely to be routed to Liquidnet
- Including controls for stock characteristics and market conditions corrects for selection bias (Bessembinder (2003))

	Volume Increase	Volume Increase	Volatility Increase	Volatility Increase
Liquidnet Dummy	-0.014***	-0.015***	-0.002***	-0.002***
Number of Trades		-0.000**		-0.000
Pre-Trade Range		-0.079***		-0.010***
Price		-0.000**		0.000
Constant	1.025***	1.039***	0.001***	0.001
Additional Controls	No	Yes	No	Yes

***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively

Alternative Explanation: Unobservable Costs

- It is also possible that higher execution quality at Liquidnet is accompanied by higher unobservable costs resulting in zero net benefit to exclusivity
- Accepting this alternative as our null hypothesis, we do not expect to see a relationship between observed abnormal execution quality and trade size at Liquidnet

	Abnormal Volume Increase	Abnormal Volatility Increase
Constant	0.001	-0.000
Liquidnet Dummy	-0.009**	-0.001*
Trade Size	0.002	0.001*
Trade Size × Liquidnet Dummy	-0.017**	-0.003**

** and * indicate significance at the 5% and 10% levels, respectively

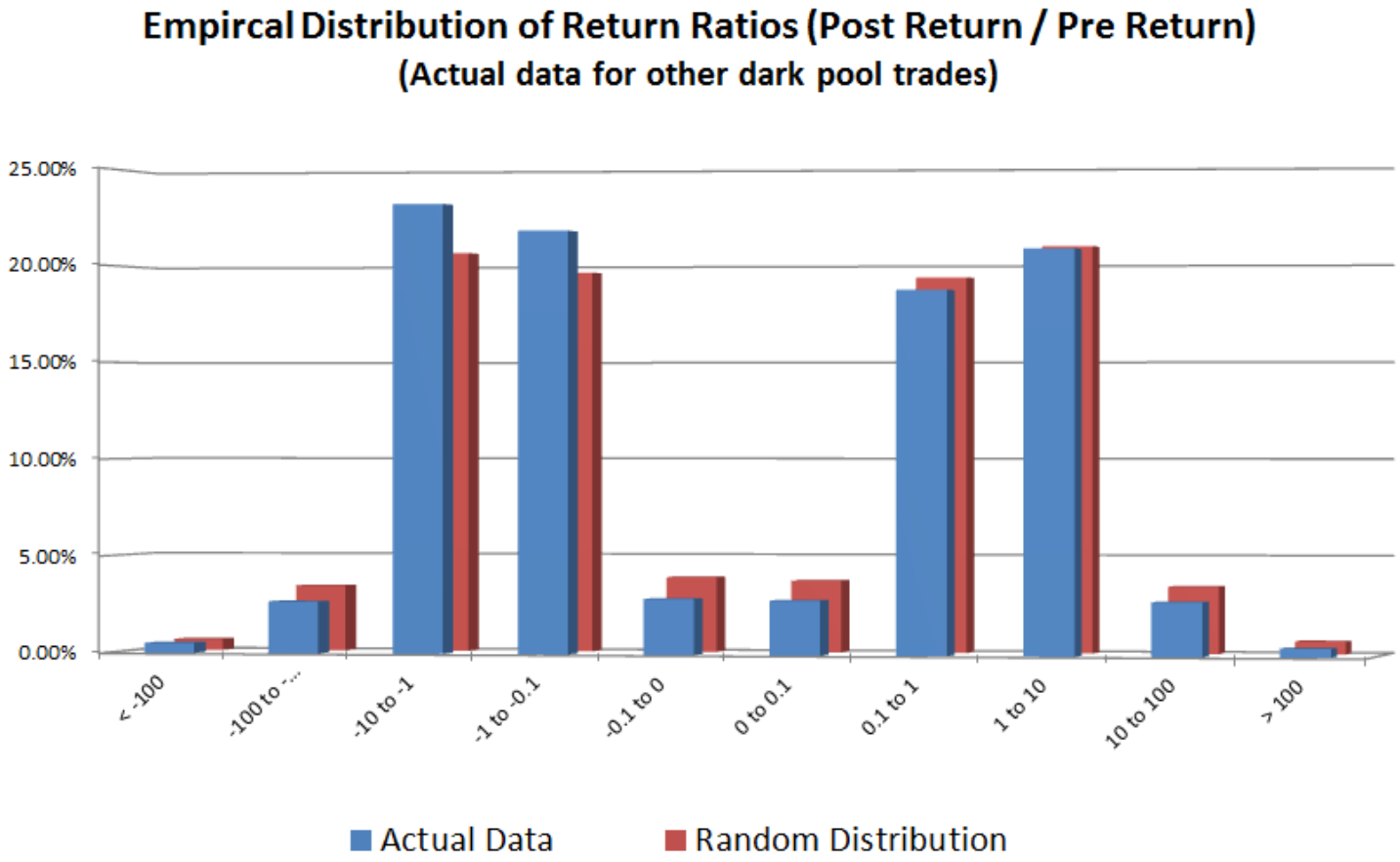
Conclusion

- Dark pool exclusivity matters for the execution quality and market impact of large trades
- Results are not due to selection bias and are likely not offset by unobservable costs
- Regulatory restrictions based on trade size will not completely solve the problem – venue design and the trading population it attracts matter for the trading experience, even among large trades
- The heterogeneity of trading clienteles and the flexibility of dark pool structures is an important component in theoretical and empirical research

Supplemental Materials

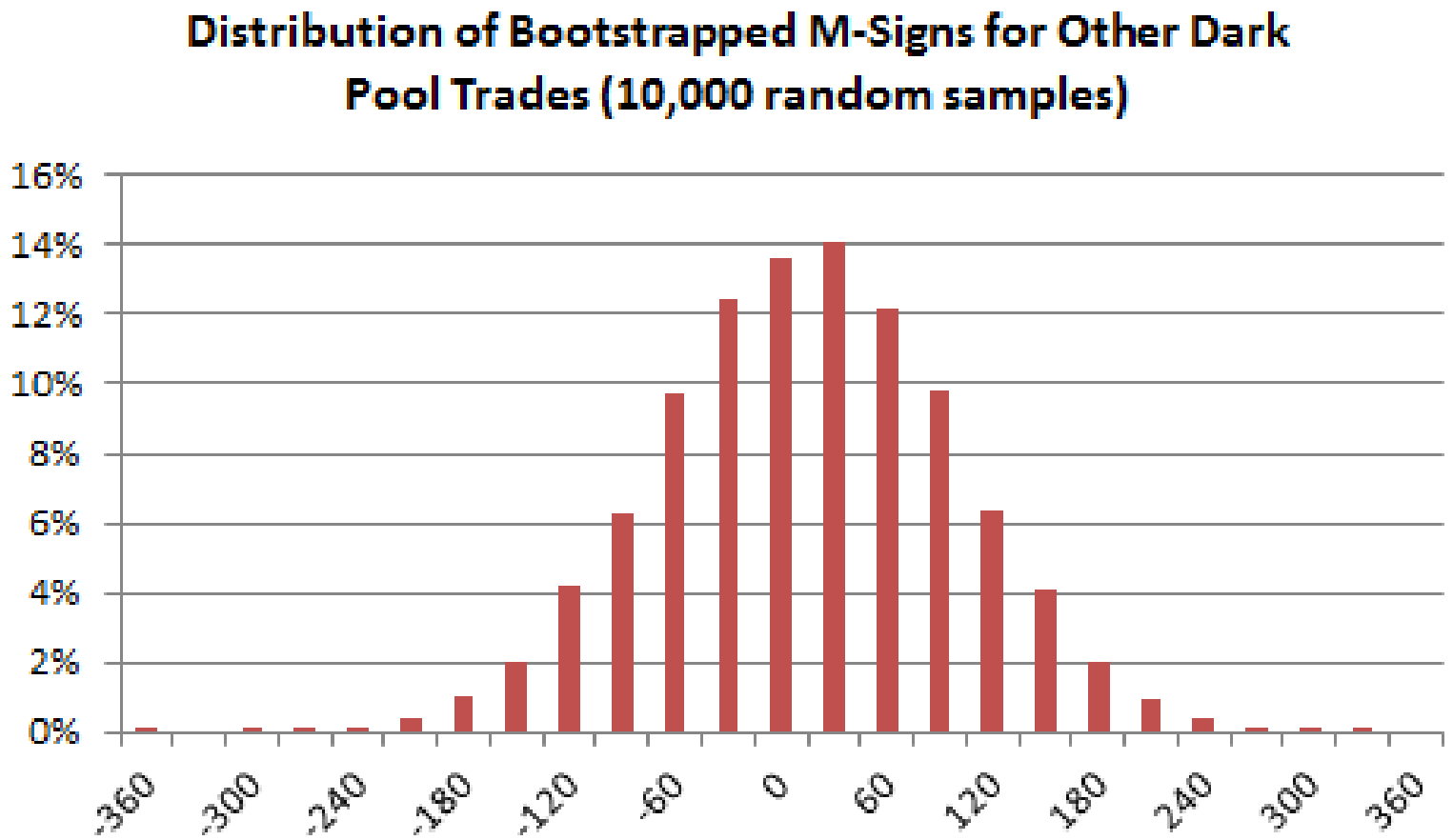
- Bootstrapped Distributions of Return Ratios and Derived Test Statistics
- Standard Correlation Measures
- Timing of Trade Reporting
- Volatility Increase Results

Bootstrapped Distribution of Return Ratios



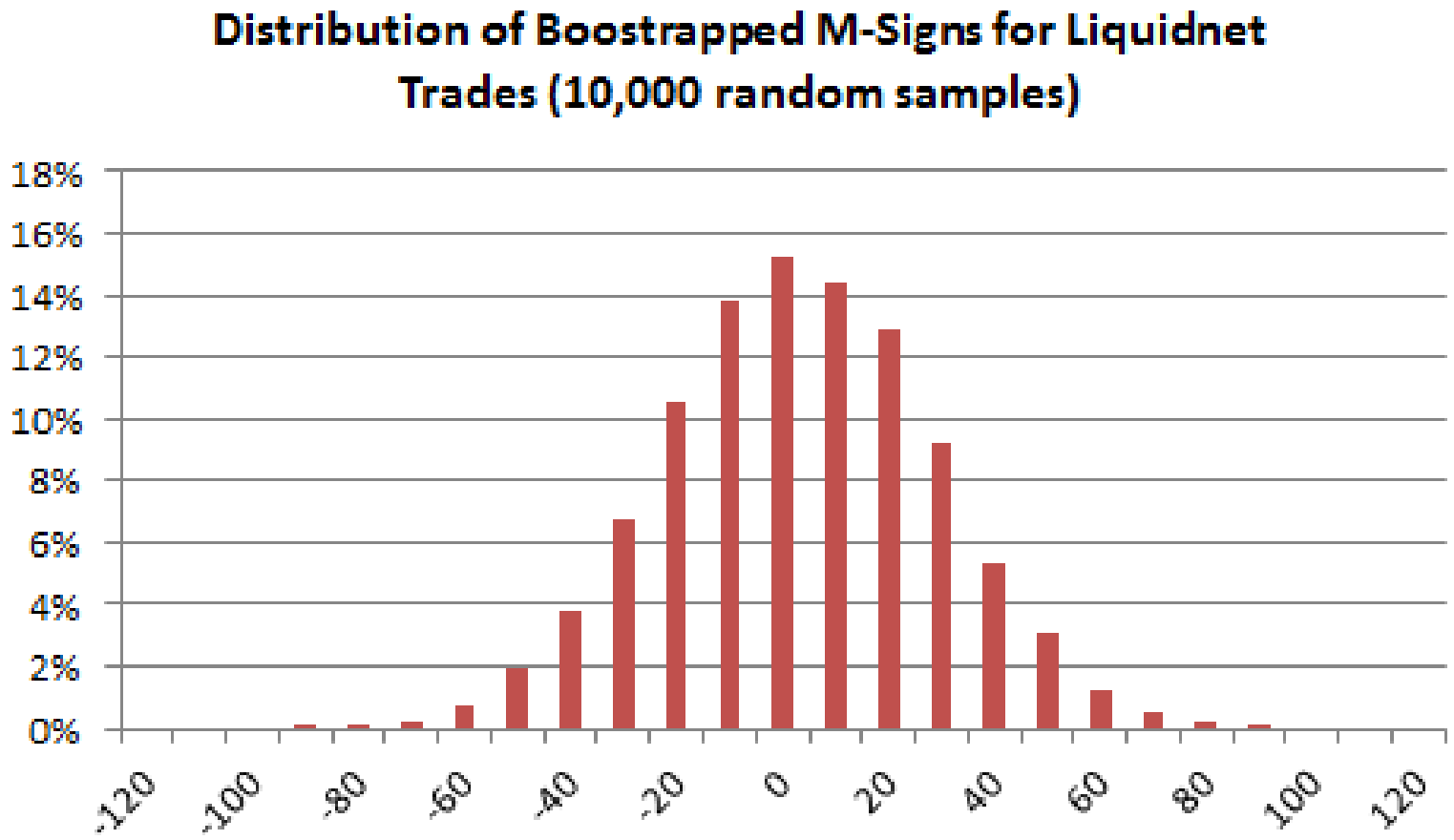
(suggests mean tests are useless due to large magnitude observations)

Bootstrapped Distribution of Test Statistic



(Central Limit Theorem at work)

Bootstrapped Distribution of Test Statistic



Standard Correlation Measures

- Non-normality of pre- and post-return distributions suggests Spearman rank correlation coefficient is more appropriate than Pearson product-moment correlation coefficient
- We use bootstrapped correlations to establish the empirical distribution of non-correlated returns

	Exclusive Dark Pool Trades	**Other Dark Pool Trades**
Spearman Correlation Coefficient of Returns	0.00101	-0.06652
P-Value	0.9712	$<$0.0001

Timing of Trade Reporting: Return Correlations

Panel A: Non-Overlapping Trades Sample

	Liquidnet Trades		Other Dark Pool Trades
M-Sign	-17.0		-782.5
P-Value (H0: Median = 0)	0.512		0.000
Sample Size	2,785		30,424
Wilcoxon Z-Score (Right > Left)		-2.335	
P-value (Equality of Medians)		0.020	

Panel B: Non-Overlapping, Within NBBO Trades Sample

	Liquidnet Trades		Other Dark Pool Trades
M-Sign	-20.0		-646.5
P-Value (H0: Median = 0)	0.424		0.000
Sample Size	2,621		24,047
Wilcoxon Z-Score (Right > Left)		-2.067	
P-value (Equality of Medians)		0.039	

Timing of Trade Reporting: Volume Increase

Panel A: Non-Overlapping Trades Sample

	Liquidnet Trades		Other Dark Pool Trades
M-Sign	25.5		986.5
P-Value (H0: Median = 0)	0.315		0.000
Sample Size	2,480		28,508
Wilcoxon Z-Score (Right > Left)		2.752	
P-value (Equality of Medians)		0.006	

Panel B: Non-Overlapping, Within NBBO Trades Sample

	Liquidnet Trades		Other Dark Pool Trades
M-Sign	18.5		746.5
P-Value (H0: Median = 0)	0.457		0.000
Sample Size	2,344		22,483
Wilcoxon Z-Score (Right > Left)		2.751	
P-value (Equality of Medians)		0.006	

Timing of Trade Reporting: Volatility Increase

Panel A: Non-Overlapping Trades Sample

	Liquidnet Trades		Other Dark Pool Trades
M-Sign	-3.0		394.5
P-Value (H0: Median = 0)	0.911		0.000
Sample Size	2,083		25,120
Wilcoxon Z-Score (Right > Left)		2.145	
P-value (Equality of Medians)		0.032	

Panel B: Non-Overlapping, Within NBBO Trades Sample

	Liquidnet Trades		Other Dark Pool Trades
M-Sign	-13.0		133.5
P-Value (H0: Median = 0)	0.565		0.049
Sample Size	1,968		19,679
Wilcoxon Z-Score (Right > Left)		1.765	
P-value (Equality of Medians)		0.078	

Results: Volatility Increase

- Hypothesis 2: More exclusive trading venues should exhibit less volatility increase prior to large trade execution
- Empirical Approach: Non-parametric sign and rank-sum tests

Percentage of Trades By Volatility Change		
	Liquidnet Trades	Other Dark Pool Trades
% Volatility Increase	49.9%	51.7%
% Volatility Decrease	50.1%	48.3%
Sample Size	2,083	25,120