



LiquidMetrix Guide to European Dark Pools – April 2011

Key Points

- This guide contains information on the following dark pools: BATS Europe Dark, BlockCross, BlockMatch™, Chi-Delta, Liquidnet, Nomura NX, POSIT, Turquoise Dark, UBS MTF.
- We analyse every trade executed on these venues comparing the price achieved to full depth lit liquidity on European trading venues.
- Based on this analysis we can quantify price improvement, EVBBO outliers and a range of other execution quality statistics for each dark pool.
- For each dark pool we also provide some general information such as market model used, stock coverage.

Overview

During April 2011 a total value of EUR 19.30bn was traded on the Dark Pools included in this guide.

Some brief statistics:

- Overall an average price improvement of **21.74 BPS** representing **EUR 41.96m** was achieved by dark pool participants compared to a strategy of sending aggressive orders to the best lit venue.
- Although all venues price off the midpoint of the primary market, well over **99%** of dark pool trades executed were also within consolidated EVBBO.
- Trade sizes on some venues were of a size that meant the trades could not have been executed on any lit venue (% illiquid on lit).

	BATS Dark	ICAP BlockCross	BlockMatch	Chi-Delta	Liquidnet	Nomura NX**	POSIT	Turquoise Dark	UBS MTF
% Illiquid on Lit	0.16%	72.50%	8.88%	0.11%	67.98%	0.68%	23.46%	0.07%	10.54%
% inside EVBBO*	99.74%	100.00%	99.75%	99.42%	100.00%	99.71%	99.59%	99.19%	99.33%
% outside EVBBO*	0.26%	0.00%	0.25%	0.58%	0.00%	0.29%	0.41%	0.81%	0.67%
% at EBBO Mid*	68.51%	73.43%	77.34%	57.71%	72.53%	69.86%	71.22%	57.88%	64.39%
Arbitrage v EBBO	0.001 BPS	0.000 BPS	0.004 BPS	0.004 BPS	0.000 BPS	0.003 BPS	0.002 BPS	0.005 BPS	0.005 BPS
Avg Onbook Spread	9.05 BPS	438.26 BPS	18.93 BPS	9.97 BPS	266.84 BPS	16.14 BPS	63.94 BPS	8.21 BPS	17.65 BPS
Avg Improvement	4.53 BPS	219.13 BPS	9.47 BPS	4.98 BPS	133.42 BPS	8.07 BPS	31.87 BPS	4.11 BPS	8.82 BPS
Worst Case Spread Capture	37.73%	44.73%	40.54%	34.12%	39.34%	37.26%	38.53%	32.79%	39.59%
Value Traded	€ 3,482 m	€ 29.03 m	€ 551m	€ 5,724 m	€ 2,221 m	€ 1,120 m	€ 1,148 m	€ 4,776 m	€ 254 m
No of trades	409,314	96	83,754	592,555	2,708	86,443	69,054	620,955	20,671
Avg Trade Size	€ 8,506	€ 302,361	€ 6,557	€ 9,661	€ 820,021	€ 12,959	€ 16,622	€ 7,692	€ 12,305
Instruments Traded (Avg p.d)	1,125 (675)	46 (5)	1,100 (267)	1,099 (706)	684 (77)	885 (343)	1,258 (344)	1,172 (729)	762 (242)
Eff Instruments (Avg p.d)	62.3 (44.4)	12.1 (2.5)	66.6 (25.0)	74.0 (53.1)	62.2 (12.1)	43.6 (18.9)	108.2 (28.2)	58.5 (43.3)	57.1 (18.8)
Fees	0.15 BPS 0.05BPS (self cross)	n/a	n/a	0.30 BPS 0.15 BPS (non IOC/ FOK)	n/a	2.00 BPS (+/- 25%)	n/a	0.30 BPS	0.10 BPS
Cleared / Counterparty	Yes CCP=EMCF	No Bilateral	No Bilateral	Yes CCP=EMCF	Bilateral/ CCP=SIX x-clear	No Bilateral	n/a n/a	Yes CCP=EURO CCP	Yes CCP=SIX x-clear

*Based on value traded

** Based on midpoint reported trades; not accounting for maker - taker fee/ rebate.

markit Data for BlockCross, BlockMatch, Liquidnet, Nomura NX, POSIT, UBS MTF is supplied by Markit BOAT. Markit BOAT is a MiFID-compliant trade reporting platform which enables MTFs and investment firms to meet their pre- and post-trade transparency obligations for their cash equity trades. For more information contact: markitboatsales@markit.com

The LiquidMetrix Guide to European Dark Pools and data for BATS Europe, Best Execution, Quantified Chi-X Europe, Turquoise is supplied by LiquidMetrix. LiquidMetrix is the suite of software services focussing on execution quality, transaction cost analysis best execution compliance and pre-trade cost prediction offered by Intelligent Financial Systems. liquidmetrix@if5.com

BATS Europe Dark

Operated By BATS Europe
 Location London Docklands

Market Model **Continuous Mid Point Matching**
 Orders are automatically cancelled at the end of the trading day.

Reference price Primary venues (PBBO)

Order Types - Market order
 - Limit order
 Parameters:
 - Time in force (DAY, GTD, IOC)
 - Min Acceptable Quantity (MAQ)

Dark Self Cross Trading:

Allows participants to only cross against their own orders.

Automatic routing to either dark or lit books available based on LIS (large in size) thresholds.

Hours Same as primary markets.
 08:00 – 16:30 (UK time)

Stock coverage 15 European countries

Austria Italy
 Belgium Norway
 Denmark Portugal
 Finland Spain
 France Sweden
 Germany Switzerland
 Holland UK
 Ireland

Users Participants must be EEA regulated investment firms or credit institutions or persons who BATS believe to be suitable for admission.

Settlement / Clearing EMCF and LCH (Ireland only)

Connectivity FIX via network vendors

Data Executions flagged 'D' are disseminated immediately via the BATS Europe market data feed.

Full order ID obfuscation along with trade side indicator set to B (buy).

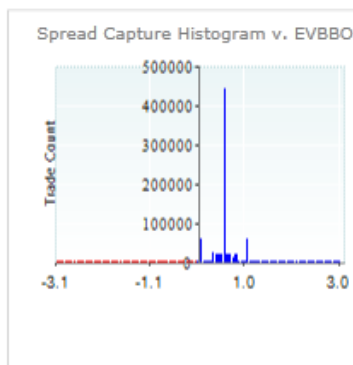
Website www.batstrading.co.uk/features

Fees 0.15 BPS
 0.05 BPS (Dark Self Cross)

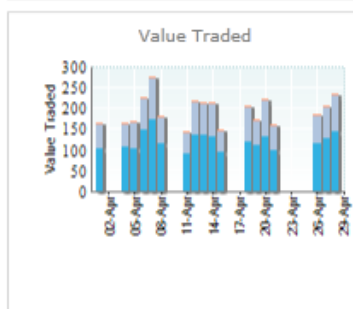
Contact SalesEurope@batstrading.com
 +44 207 012 8906

Launched

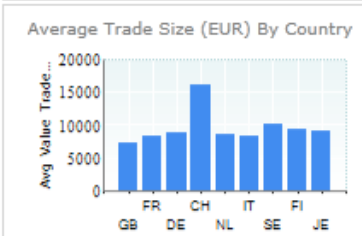
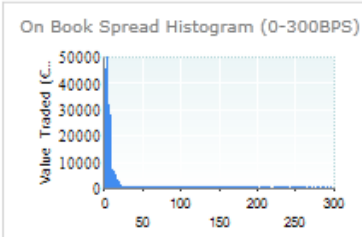
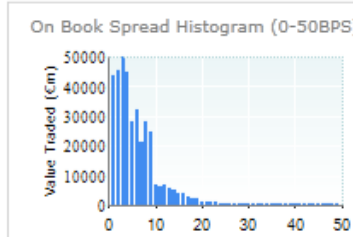
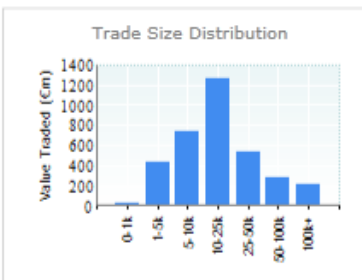
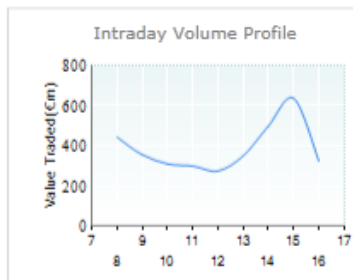
BATS Europe Dark



% Illiquid On Lit	0.16%
% Inside EVBBO (by value traded)	99.66%
% Outside EVBBO (by value traded)	0.34%
% At EBBO Mid (by value traded)	0.26%
% At EBBO Mid (by value traded)	(66.70%)
Arbitrage v. EVBBO	(68.51%)
Avg On Book Spread	0.001 BPS
Avg Improvement	9.05 BPS
Worst Case Improv.	4.53 BPS
Worst Case Sprd Cap.	3.42 BPS
	37.73%



Value Traded	€3,481,651,945
EUR:	1,604.8m
GBX:	1,099.6m
CHF:	556.3m
SEK:	921.4m
NOK:	355.1m
DKK:	326.1m
USD:	1.1m
Number Of Trades	409,314
Avg. Trade Size	€8,506
Median Trade Size	€5,078
Instruments Traded (Avg. Per Day)	1,125 (675)
Eff. Instruments (Avg Per Day)	62.3 (44.4)

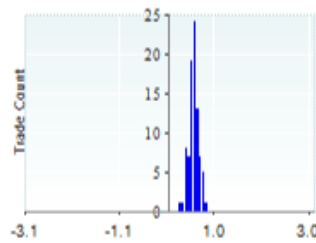


ICAP BlockCross

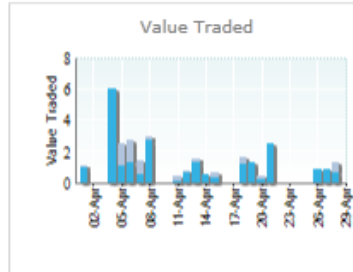
Operated By	ICAP Securities Ltd
Location	London
Market Model	Continuous Mid Point Matching Orders are matched by time priority.
	Global Minimum Acceptable Quantities
	Automatic 'Contra Alerts' are sent with instrument / side.
	Members can send anonymous IOIs
Reference price	Primary venues (PBBO)
Order Types	- Market order - Limit order Parameters: - Time in force (DAY, GTD, IOC) - dynamic Price Collar
Hours	Same as primary markets. 08:00 – 16:30 (UK time)
Stock coverage	18 European countries Austria Italy Belgium Norway Czech Republic Poland Denmark Portugal Finland Spain France Sweden Germany Switzerland Holland UK Hungary
Users	Buy and sell sides. A 'Quality Indicator' (QI) is calculated for each member.
Settlement / Clearing	ICAP Securities Limited is the counterparty. Trade aggregation is supported.
Connectivity	BlockCross GUI or directly via API
Data	Executions are reported to Markit BOAT.
Website	www.icap.com/blockcross
Fees	Not disclosed
Contact	+44 207 000 5191 blockcross.info@icap.com
Launched	October 2009

ICAP BlockCross

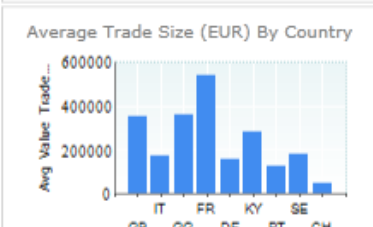
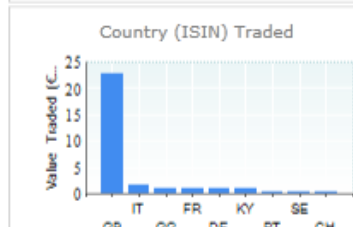
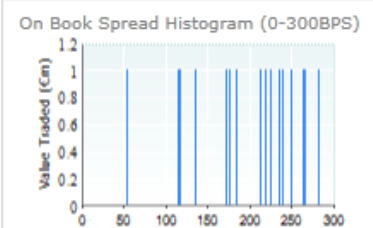
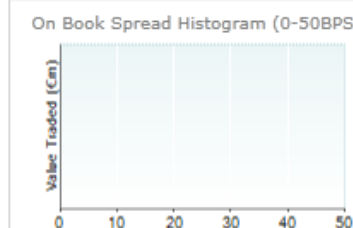
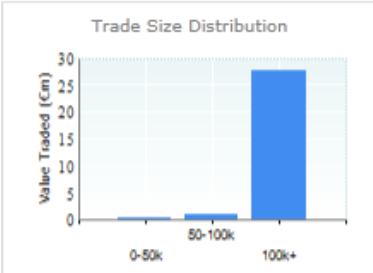
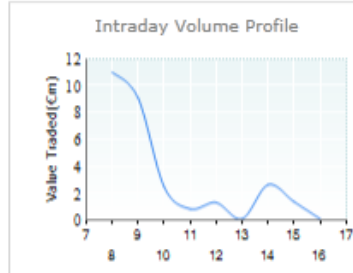
Spread Capture Histogram v. EVBBO



% Illiquid On Lit	72.50%
% Inside EVBBO (by value traded)	100.00%
% Outside EVBBO (by value traded)	0.00%
% At EBBB Mid (by value traded)	(82.00%)
Arbitrage v. EVBBO	0.000 BPS
Avg On Book Spread	438.26 BPS
Avg Improvement	219.13 BPS
Worst Case Improv.	196.05 BPS
Worst Case Sprd Cap.	44.73%



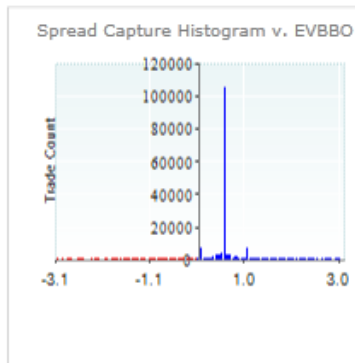
Value Traded	€29,026,615
GBX:21.7m EUR:4.1m SEK:1.6m CHF:0.2m	
Number Of Trades	96
Avg. Trade Size	€302,361
Median Trade Size	€187,071
Instruments Traded (Avg. Per Day)	46 (5)
Eff. Instruments (Avg Per Day)	12.1 (2.5)



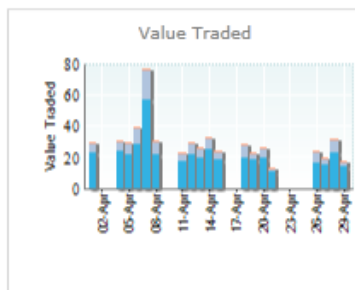
BlockMatch™

Operated By	Instinet Europe Limited
Location	London
Market Model	Continuous Mid Point Matching and Closing Cross using closing auction uncrossing price
Reference price	Primary venues (PBBO)
Order Types	- Market order - Limit order Parameters: - Time in force (DAY,GTD,IOC) - Min Execution Quantity
Hours	Same as primary markets. 08:00 – 16:30 (UK time) Continuous matching 16:40 – 17:00 (UK time) Closing Cross
Stock coverage	14 European countries Austria Italy Belgium Norway Denmark Portugal Finland Spain France Sweden Germany Switzerland Holland UK
Users	Approved clients of Instinet Europe Limited.
Settlement / Clearing	
Connectivity	
Data	Trades are reported to Markt BOAT.
Website	www.instinet.com
Fees	Not disclosed
Contact	26 th Floor, 25 Canada Square, London, E14 5LB +44 207 154 8400
Launched	June 2008

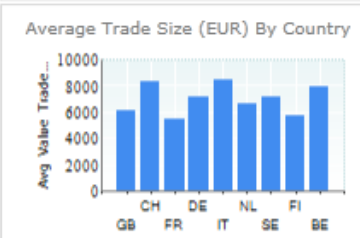
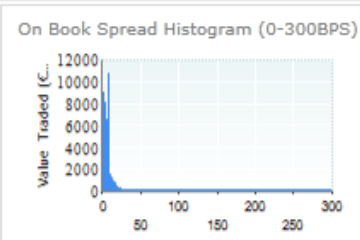
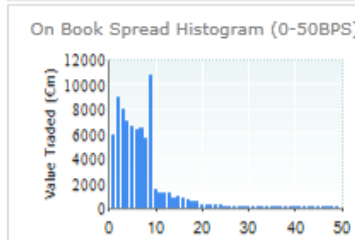
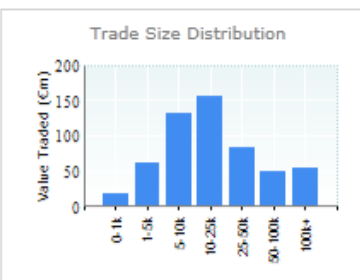
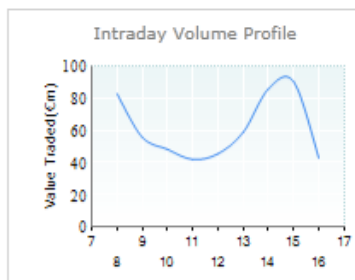
BlockMatch™



% Illiquid On Lit	8.88%
% Inside EVBBO (by value traded)	99.66% 99.75%
% Outside EVBBO (by value traded)	0.34% 0.25%
% At EBBO Mid (by value traded)	(77.83%) (77.34%)
Arbitrage v. EVBBO	0.004 BPS
Avg On Book Spread	18.93 BPS
Avg Improvement	9.47 BPS
Worst Case Improv.	7.68 BPS
Worst Case Sprd Cap.	40.54%



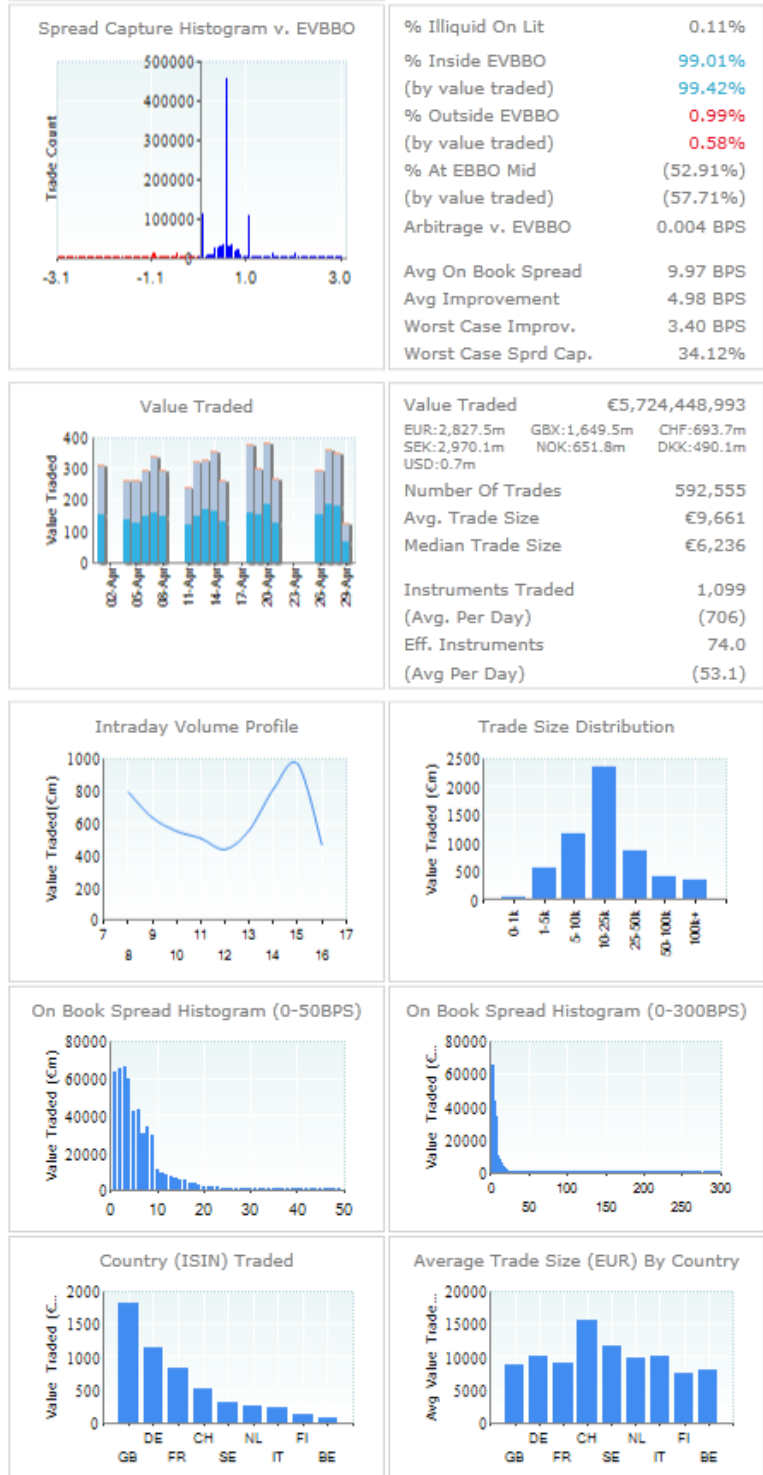
Value Traded	€550,859,280		
GBX:179.4m	EUR:193.4m	CHF:155.6m	
SEK:200.7m	DKK:40.1m	NOK:33.2m	USD:0.0m
Number Of Trades	83,754		
Avg. Trade Size	€6,577		
Median Trade Size	€2,131		
Instruments Traded	1,100		
(Avg. Per Day)	(267)		
Eff. Instruments	66.6		
(Avg Per Day)	(25.0)		



Chi-Delta™

Operated By	Chi-X Europe
Location	London
Market Model	Continuous Mid Point Matching Orders are matched by time priority unless a minimum quantity is set or the order is outside its limit. Orders are automatically cancelled at the end of the trading day.
Reference price	Primary venues (PBBO)
Order Types	- Market order - Limit order Parameters: - Time in force (DAY,GTD,IOC,FOK) - Min Quantity (MinQty)
Hours	Same as primary markets. 08:00 – 16:30 (UK time)
Stock coverage	15 European countries Austria Italy Belgium Norway Denmark Portugal Finland Spain France Sweden Germany Switzerland Holland UK Ireland
Users	Participants must be able to demonstrate sufficient experience in trading cash equities or similar securities.
Settlement / Clearing	EMCF
Connectivity	FIX 4.2 via network vendors
Data	Trades are reported immediately on the CHI-X market data feed.
Website	www.chi-xeurope.com
Fees	0.15 BPS (non IOC/FOK orders) 0.30 BPS (all others) Clearing fees (per clearing member) 0.03c p. trade < 100k trades p.d. 0.01c p. trade > 100k trades p.d. 0.05c p. order < 75k orders p.d. 0.03c p. order > 75k orders p.d.
Contact	6 th Floor, Lower Thames Street London, EC3R 6AF +44 207 131 3333
Launched	

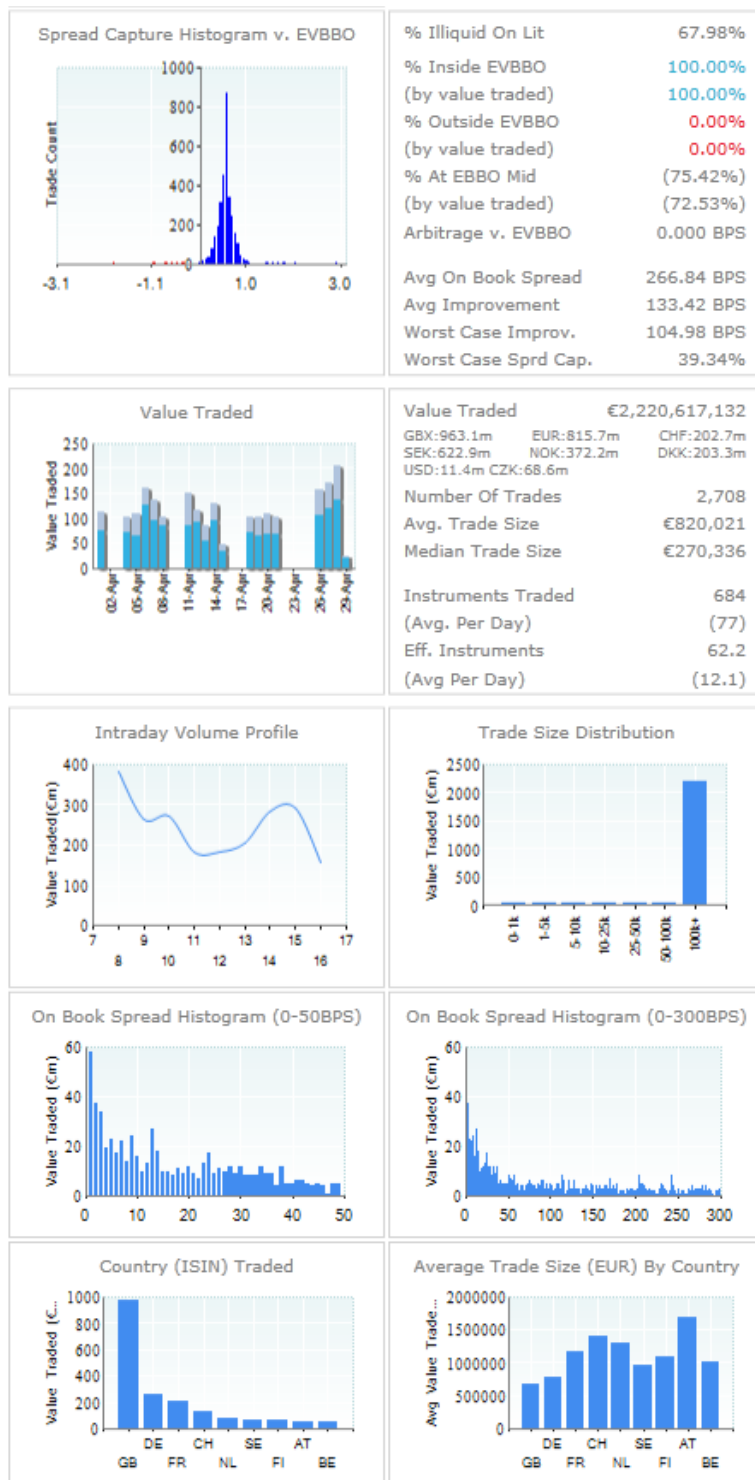
Chi-Delta™



Liquidnet

Operated By	Liquidnet																												
Location	London																												
Market Model	Automatic mid point matching and negotiated trades.																												
Reference price	Primary venues																												
Order Types	- Market order - Limit order																												
Hours	Same as primary markets. 08:00 – 16:30 (UK time)																												
Stock coverage	39 markets covering Europe:																												
	<table border="0"> <tr><td>Austria</td><td>Israel</td></tr> <tr><td>Belgium</td><td>Italy</td></tr> <tr><td>Cyprus</td><td>Latvia</td></tr> <tr><td>Czech Rep</td><td>Lithuania</td></tr> <tr><td>Denmark</td><td>Luxembourg</td></tr> <tr><td>Estonia</td><td>Norway</td></tr> <tr><td>Finland</td><td>Poland</td></tr> <tr><td>France</td><td>Portugal</td></tr> <tr><td>Germany</td><td>Slovenia</td></tr> <tr><td>Greece</td><td>Spain</td></tr> <tr><td>Holland</td><td>Sweden</td></tr> <tr><td>Hungary</td><td>Switzerland</td></tr> <tr><td>Iceland</td><td>UK</td></tr> <tr><td>Ireland</td><td></td></tr> </table>	Austria	Israel	Belgium	Italy	Cyprus	Latvia	Czech Rep	Lithuania	Denmark	Luxembourg	Estonia	Norway	Finland	Poland	France	Portugal	Germany	Slovenia	Greece	Spain	Holland	Sweden	Hungary	Switzerland	Iceland	UK	Ireland	
Austria	Israel																												
Belgium	Italy																												
Cyprus	Latvia																												
Czech Rep	Lithuania																												
Denmark	Luxembourg																												
Estonia	Norway																												
Finland	Poland																												
France	Portugal																												
Germany	Slovenia																												
Greece	Spain																												
Holland	Sweden																												
Hungary	Switzerland																												
Iceland	UK																												
Ireland																													
	and also Americas and APAC.																												
Users	Approved clients of Liquidnet																												
Settlement / Clearing	Bilateral settlement model for Buyside institutions, CCP clearing model available for Brokers who have a membership with CCP (SIX X-clear).																												
Connectivity	FIX, Customer OMS Integration																												
Data	Trades are reported to Markit BOAT.																												
Website	www.liquidnet.com																												
Fees	Not disclosed																												
Contact	21st Floor, Broadgate Tower, Primrose Street, Bishopsgate, London, EC2A 2EW +44 (0)20 7614 1653 pmstay@liquidnet.com																												
Launched	2002																												

Liquidnet



Nomura NX

Operated By Nomura International plc
Location London
Market Model
1. **NX Mid Match (NXMM)**
Periodic (within 30s) auction
mid point crossing
2. **NX Strategy Match (NXSM)**
Continuous primary VWAP
order crossing (every 15 min)

Reference price Primary markets
Order Types
- Market order
- Limit order
1. NX Mid Match (NXMM)
Parameters:
- Time in force (Day, IOC, FOK)
- Minimum fill (initial, anytime, residual)
2. NX Strategy Match (NXSM)
Parameters:
- Start time
- End time

Hours Same as primary markets.
Orders can be entered from 07.00 (UK time).

Stock coverage 15 European countries
Austria Italy
Belgium Norway
Denmark Portugal
Finland Spain
France Sweden
Germany Switzerland
Holland UK
Ireland

Stocks Supported: 7047

Users Investment firm or credit institution
incorporated & regulated in the EEA
or firm deemed to be fit and
proper.

Settlement / Clearing Nomura is the counterparty. No
CCP. Trade aggregation by
instrument is possible.

Connectivity FIX via network vendors

Data All executions including AIM
stocks are reported to Markit
BOAT.

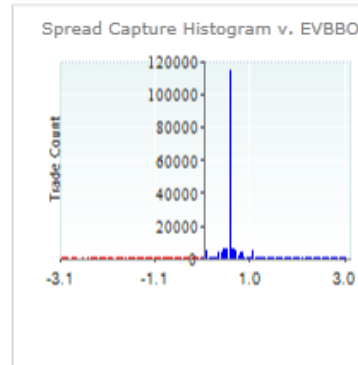
Website www.nomura.com/nx

Fees 2 BPS on executed orders
Tariff = x bps + y %spread
x = commission charged
y = +25% (IOC / FOK orders)
y = -25% rebate (passive orders)

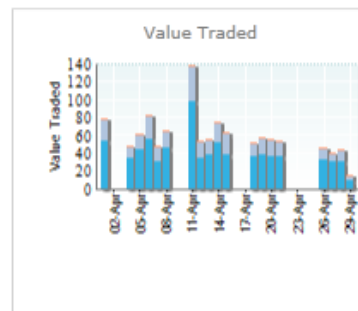
Contact One Angel Lane
London, EC4R 3AB
+44 (0) 20 7103 3217
NX.EU@nomura.com

Launched January 2010

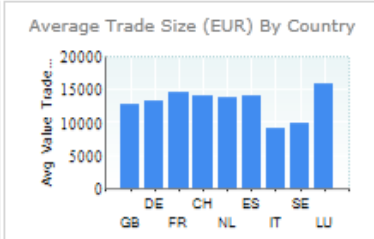
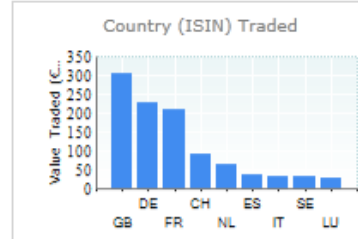
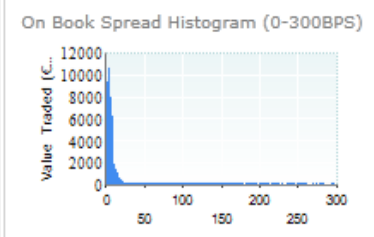
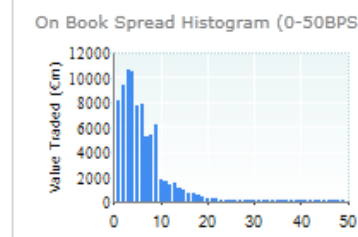
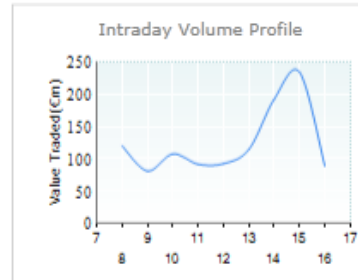
Nomura NX



% Illiquid On Lit	0.68%
% Inside EVBBO	99.23%
(by value traded)	99.71%
% Outside EVBBO	0.77%
(by value traded)	0.29%
% At EVBBO Mid	(73.32%)
(by value traded)	(69.86%)
Arbitrage v. EVBBO	0.003 BPS
Avg On Book Spread	16.14 BPS
Avg Improvement	8.07 BPS
Worst Case Improv.	6.01 BPS
Worst Case Sprd Cap.	37.26%



Value Traded	€1,120,251,483	
EUR:647.4m	GBX:278.8m	CHF:121.7m
SEK:268.5m	DKK:131.8m	NOK:103.6m
USD:0.1m		
Number Of Trades	86,443	
Avg. Trade Size	€12,959	
Median Trade Size	€4,177	
Instruments Traded	885	
(Avg. Per Day)	(343)	
Eff. Instruments	43.6	
(Avg Per Day)	(18.9)	

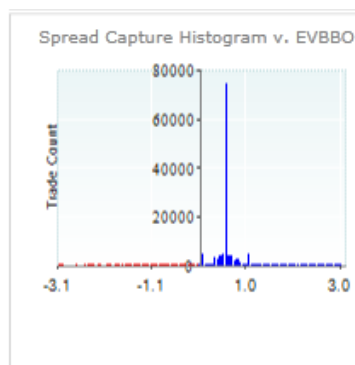


Note, values are based on midpoint matched trades only (prices do not account for maker-taker rebate/ fee). In addition, NX Strategy Match trades are **excluded**.

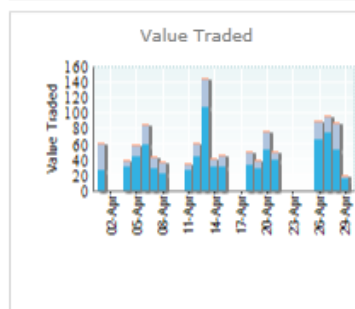
POSIT

Operated By	ITG (Investment Technology Group Europe Ltd.)
Location	London
Market Model	POSIT Now™: Continuous Mid Point Matching Orders are matched continuously by time priority unless a minimum quantity is set
	Market Flow option: Unfilled POSIT balances are routed on to specified venue.
Reference price	Primary venues (PBBO)
Order Types	- Market order - Limit order
Hours	Same as primary markets. 08:00 – 16:30 (UK time)
Stock coverage	20 European countries Austria Ireland Belgium Italy Czech Rep Norway Denmark Portugal Finland South Africa France Spain Germany Sweden Greece Switzerland Holland Turkey Hungary UK
Users	Institutional buy and sell sides.
Settlement / Clearing	
Connectivity	FIX connectivity or ITG front ends: Triton, Channel ITG
Data	Trades are reported on Markt BOAT.
Website	www.itg.com
Fees	Not provided
Contact	River Plate House 7-11 Finsbury Circus London EC2M 7EB, UK + 44-207-670-4150 info@itg.com
Launched	1998

POSIT



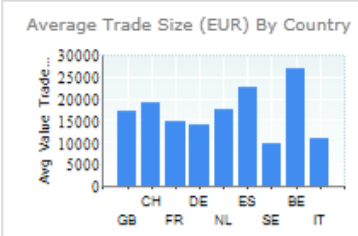
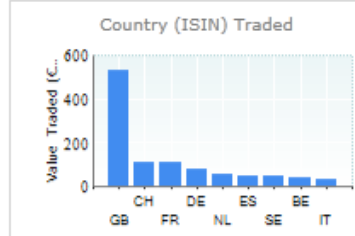
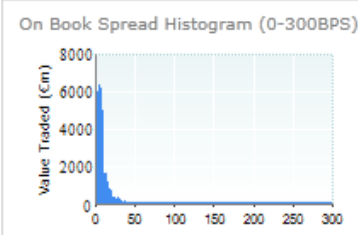
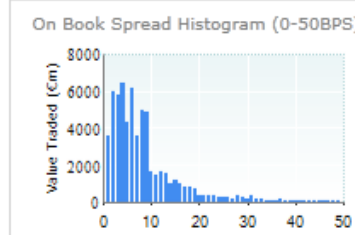
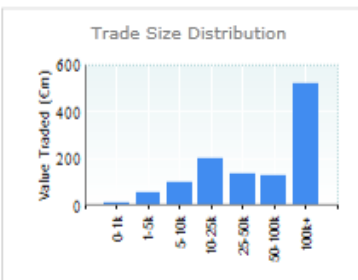
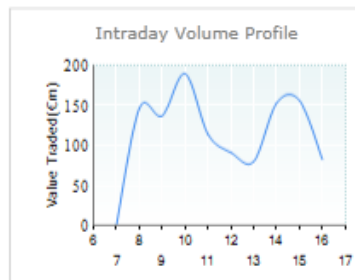
% Illiquid On Lit	23.46%
% Inside EVBBO (by value traded)	99.15%
% Outside EVBBO (by value traded)	99.59%
% At EBBO Mid (by value traded)	0.85%
% At EBBO Mid (by value traded)	0.41%
Arbitrage v. EVBBO	(71.61%)
	(71.22%)
Avg On Book Spread	0.002 BPS
Avg Improvement	63.74 BPS
Worst Case Improv.	31.87 BPS
Worst Case Sprd Cap.	24.56 BPS
	38.53%



Value Traded €1,147,823,546

GBX:494.2m EUR:402.8m CHF:151.3m
SEK:392.1m DKK:83.3m NOK:75.0m USD:1.2m
CZK:4.7m ZAR:39.2m HUF:3.1m

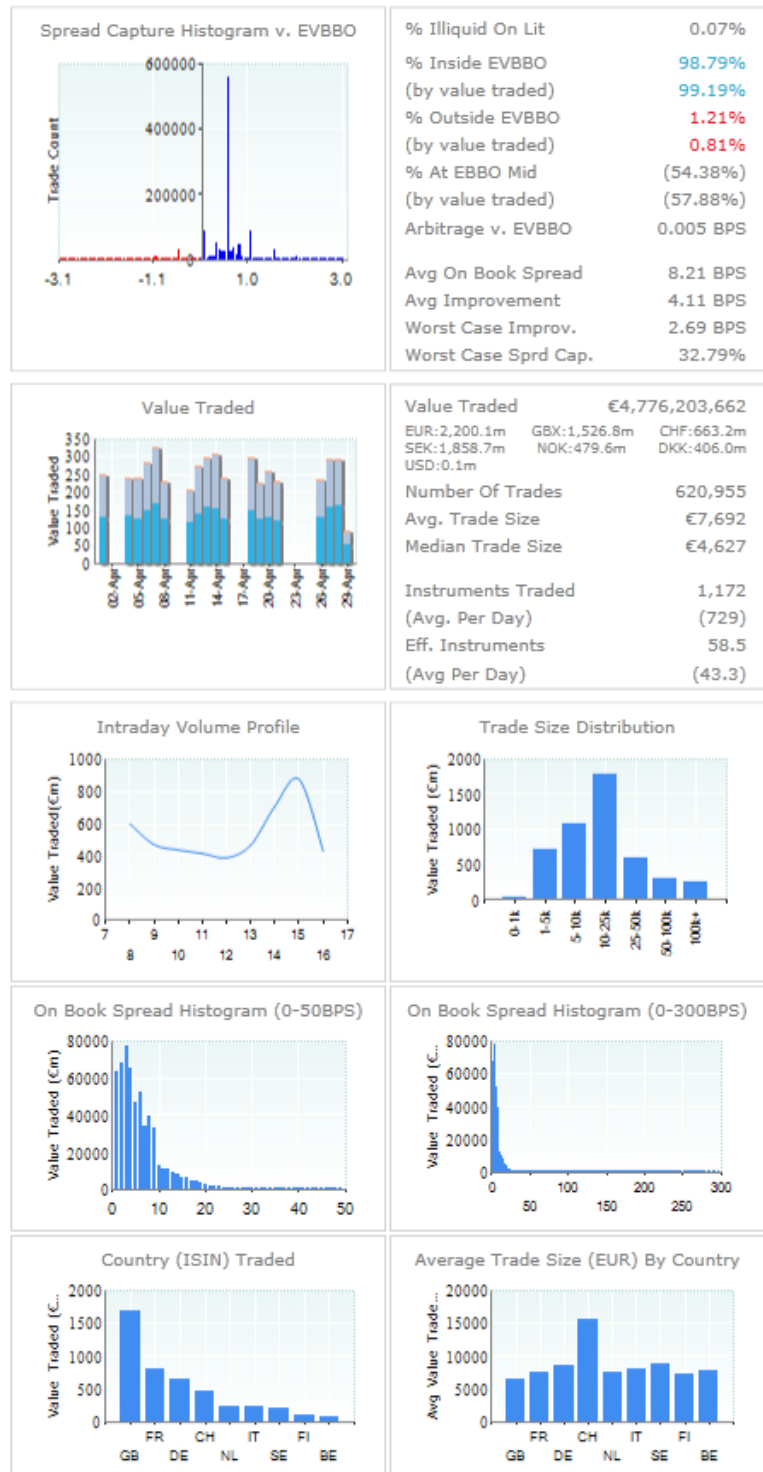
Number Of Trades	69,054
Avg. Trade Size	€16,622
Median Trade Size	€4,919
Instruments Traded (Avg. Per Day)	1,258 (344)
Eff. Instruments (Avg Per Day)	108.2 (28.2)



Turquoise Dark

Operated By	Turquoise (London Stock Exchange Group)																
Location	London																
Market Model	<ul style="list-style-type: none"> - Continuous Mid Point Matching - Ability to opt-out of interacting with IOC via Randomised Periodic Matches <p>Orders are matched by time priority unless a minimum quantity is set. Orders are automatically cancelled at the end of the trading day. Matching occurs unless primary fails the 'Well Formed Market Checks'.</p>																
Reference price	Primary venues (PBBO)																
Order Types	<ul style="list-style-type: none"> - Market order - Limit order - Pegged order <p>Parameters:</p> <ul style="list-style-type: none"> - Time in force (GTD, DAY, IOC, FOK, FAK) - Peg cap/Floor - Min Acceptable Quantity (MAQ) <p>Automatic routing for orders to either dark or lit books based on LIS (large in size) thresholds.</p>																
Hours	Same as primary markets. 08:00 – 16:30 (UK time)																
Stock coverage	<p>15 European countries</p> <table border="0"> <tr><td>Austria</td><td>Italy</td></tr> <tr><td>Belgium</td><td>Norway</td></tr> <tr><td>Denmark</td><td>Portugal</td></tr> <tr><td>Finland</td><td>Spain</td></tr> <tr><td>France</td><td>Sweden</td></tr> <tr><td>Germany</td><td>Switzerland</td></tr> <tr><td>Holland</td><td>UK</td></tr> <tr><td>Ireland</td><td></td></tr> </table>	Austria	Italy	Belgium	Norway	Denmark	Portugal	Finland	Spain	France	Sweden	Germany	Switzerland	Holland	UK	Ireland	
Austria	Italy																
Belgium	Norway																
Denmark	Portugal																
Finland	Spain																
France	Sweden																
Germany	Switzerland																
Holland	UK																
Ireland																	
Users	EEA regulated investment firm or credit institution or deemed to be fit and proper.																
Settlement / Clearing	Euro CCP (self matched trades can be excluded)																
Connectivity	FIX 5.0 SP2 or native interface via network vendors or LSE Extranex.																
Data	Trades are reported immediately on the Turquoise market data feed.																
Website	www.tradeturquoise.com																
Fees	0.30 BPS																
Contact	10 Paternoster Square London, EC4M 7LS +44 20 7382 7650 sales@tradeturquoise.com																
Launched	2009																

Turquoise Dark

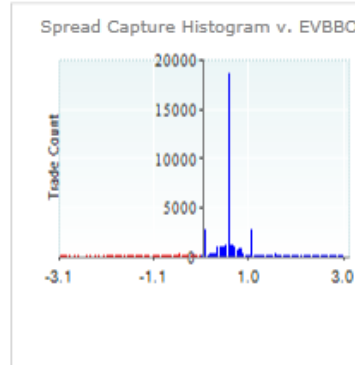


These results do not reflect the impact of market data infrastructure improvements Turquoise made during May.

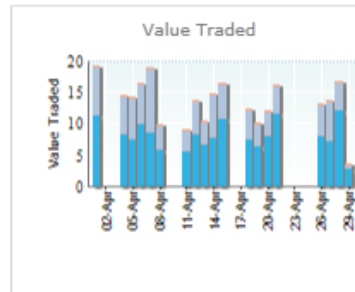
UBS MTF

Operated By	UBS
Location	London
Market Model	Mid point matching using price time priority.
Reference price	Primary market PBBO
Order Types	- Market order - Limit order - Pegged order (Day orders only) Min order size: 1
Hours	Same as primary markets: 08:00 – 16:30 (UK time) No matching during auctions. Support available 07:30 – 17:30 (UK time)
Stock coverage	12 European countries Austria Holland Belgium Norway Denmark Portugal Finland Sweden France Switzerland Germany UK
Users	Any EEA regulated investment firm or credit institution or a member of another EEA Regulated Market.
Settlement / Clearing	Participants must have a membership with the CCP (SIX x-clear) used by UBS MTF or have access via a GCM (General Clearing Member).
Connectivity	FIX 4.2
Data	Executions are reported in real time to Markit BOAT.
Website	www.ubs.com/mtf
Fees	0.10 BPS per executed order No membership fees.
Contact	1 Finsbury Avenue London EC2M 2PF UBS_MTF@ubs.com +44 20 7568 2052
Launched	November 2010

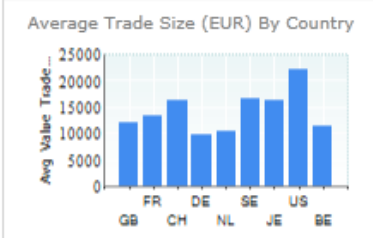
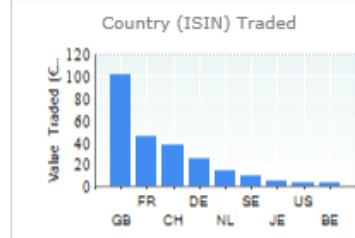
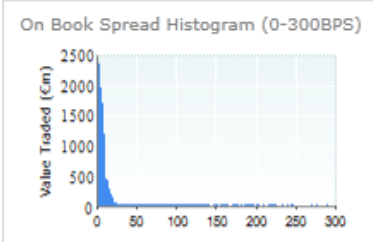
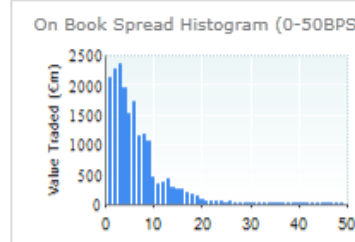
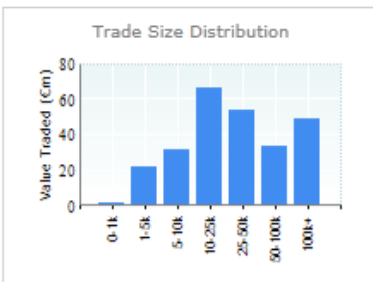
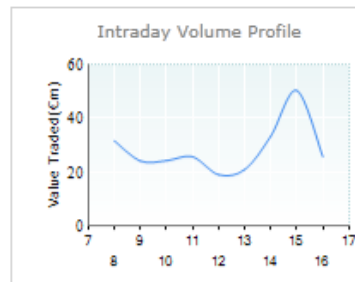
UBS MTF



% Illiquid On Lit	10.54%
% Inside EVBBO (by value traded)	98.50%
% Outside EVBBO (by value traded)	99.33%
% At EBBO Mid (by value traded)	1.50%
% At EBBO Mid (by value traded)	0.67%
Arbitrage v. EVBBO	(60.90%) (64.39%)
Avg On Book Spread	0.005 BPS
Avg Improvement	17.65 BPS
Worst Case Improv.	8.82 BPS
Worst Case Sprd Cap.	6.99 BPS
	39.59%



Value Traded	€254,365,282
GBX:92.0m EUR:96.1m CHF:52.4m SEK:80.6m NOK:17.4m DKK:12.3m USD:0.0m	
Number Of Trades	20,671
Avg. Trade Size	€12,305
Median Trade Size	€5,510
Instruments Traded (Avg. Per Day)	762 (242)
Eff. Instruments (Avg Per Day)	57.1 (18.8)



Methodology

Data / Sources

This analysis is based on all trades executed on the 'Dark Pools' included in the report. For the Chi-Delta, Turquoise Dark and BATS Dark venues, this data is sourced directly from the exchange market data feeds. For other venues, we are using the trade details published by Markit BOAT. Where available we are using millisecond accurate timestamps as published by the sources (see note on hi-lo band benchmarking below).

When comparing the prices executed on the Dark Pools with lit book liquidity, the lit book liquidity is based on European venues (MTF and primary). In this case data comes from a mixture of direct exchange sources and some data via 3rd part quote vendors. In all cases data is millisecond time stamped.

Currency Conversions

We convert all values to EUR using a single currency rate based on the average currency rate over the reporting period.

LiquidMetrix Price Benchmarking Methodology

Some of the results published in the LiquidMetrix guide are derived from analysing the price of the dark pool trades against benchmarks derived from the state of all fungible lit order books around the instant of the Dark Pool trade. For each Dark Pool trade we calculate the following benchmark prices:

- **EBBO Touch prices (Exact Time)** - We take a consolidated order book from all venues trading a fungible instrument at the exact instant of the dark pool trade and record the best bid and offer.
- **EVBBO Prices (Exact Time)** - In this case we take order books from all venues trading a fungible instrument at the exact instant of the Dark Pool trade and against each venue in turn we find the volume weighted average price that would be achieved by sending an aggressive buy (and sell) order of the same size as the Dark Pool trade to that venue. This gives us *effective* volume weighted bids and offers for each venue. We then select the lowest effective offer price from any venue and the highest effective bid price from any venue and these are the benchmarks used. Note, this is different to simply consolidating all liquidity into a single consolidated order book. Instead we are saying the benchmark price must be based on routing a single order to the single best venue, not splitting orders and hitting all venues simultaneously.
- **EVBBO Prices (Hi-Lo Band +/- 1s)** - This benchmark is calculated in the same way as EVBBO Price (Exact Time) except that rather than just calculating the benchmark at the exact instant of the Dark Pool Trade, we consider all order book states in a 2 second period centered about the trade and select the order book state that would yield the *worst* benchmark prices. So in effect this benchmark price represents a price that could have been achieved (or bettered) at any time in a +/- 1 second window about the Dark Pool by sending a single aggressive order to the venue with the best price. The reason we use this benchmark is primarily to compensate for 'timestamp noise' for some Dark Pool venues where the public data we have is only accurate to 1 second.

Field-By-Field Descriptions

Spread Capture Histogram

This histogram shows the frequency (trade count) that trades capture a particular fraction of the EVBBO spread (using exact trade time). So, for instance, if the trade occurs at exactly the EVBBO mid price then the spread capture is 0.5. If the trade occurs at the exact EVBBO bid then the spread capture will be 0 for the seller and 1 for the buyer. If the trade happens outside EBBO the spread capture will be outside of the range (0,1) for both buyer and seller. Note that for every trade, we count both seller and buyer, so this histogram will be symmetric about 0.5. The histogram gives a good visualisation of exactly 'where' within EVBBO each trade is falling.

% Illiquid On Lit

This is the percentage of traded value for which the trade examined was too large to be executed fully on any one lit order book at the time of the trade. Because no fair benchmark based on EVBBO can be determined, such trades are *excluded* from subsequent statistics in this section. They also do not feature in the spread capture histogram. A high value here means the trades occurring on a dark pool are generally larger than can be done on available lit venue liquidity.

% At EBBO Mid

This is the percentage of trades that occurs at exactly EBBO mid price at the exact trade time. As most venues match on primary venue BBO mid rather than EBBO (or EVBBO) this number is often quite low. Values are shown based on both trade count and value traded.

% Inside EVBBO

This is the percentage of trades (by count) that occur within EVBBO spread based on +/- 1 second Hi-Lo Band benchmark. For these trades the price obtained is at least as good (for both buyer and seller) as any price that could be obtained routing a single aggressive order to any lit venue. Values are shown based on both trade count and value traded.

% Outside EVBBO

This is the inverse of the '% Inside EVBBO' statistic above and shows the number of times that a trade occurred at a price outside EVBBO spread based on a +/- 1 second Hi-Lo Band benchmark. In this case one side of the trade could have obtained a better price by aggressively routing a single order to a lit venue. Values are shown based on both trade count and value traded.

Arbitrage v. EVBBO

This statistic is calculated by taking all trades that occurred outside EVBBO and then calculating the implicit arbitrage value of taking one side of the dark pool trade and exiting immediately via an aggressive order against EVBBO. The figure is expressed as a number of basis points of the total

value traded on the dark pool.

Avg On Book Spread

Average EVBBO spread at the exact time of all trades, weighted by the value of each trade.

Avg Improvement

The average price improvement enjoyed by both sides of each trade averaged over all trades. This is half the Average On Book Spread value.

Worst Case Improvement / Worst Case Spread Capture

For this statistic we consider every trade and in each case we examine the price improvement (shortfall) enjoyed by the side of the trade with the *least favourable* price relative to EVBBO mid price (for EVBBO spread capture = 0.5 we choose the Buyer as there is no 'loser'), i.e. in every case we choose the relative 'loser' versus EVBBO. We report the average price improvement the loser obtains in BPS. We also report the **Worst Case Spread Capture**. This is calculated as Worst Case Improvement / Avg On Book Spread and shown as a percentage.

Value Traded Histogram

This histogram shows the total value traded (in EUR) each day. The bars are colour coded to show the proportion (by value) of trades that occur at exact EBBB mid (dark blue), inside EVBBO (light blue) or outside EVBBO (red).

Value Traded

Total value traded on the venue over the reporting period expressed in EUR. Underneath the value traded is a breakdown by currency.

Number Of Trades

Total number of trades executed on the dark pool venue in the reporting period.

Avg Trade Size

Average trade size (in EUR) executed on the venue over the reporting period, i.e. total value traded / number of trades.

Median Trade Size

Median trade size (in EUR) executed on the venue over the reporting period.

Instruments Traded

Total number of distinct instruments/ names traded over the reporting period.

(Avg per day)

Average number of distinct instruments traded *each day* over the reporting period.

Eff. Instruments

The Effective Instruments Traded statistic is a Hirfendahl index calculated based on the value traded in each distinct instrument over the reporting period. As an example if 10 instruments are traded over the period and the fractions of value traded in each instrument was (0.5, 0.1, 0.1, 0.1, 0.1, 0.1) then the effective number of instruments traded would be:

$$= \frac{1}{1*(0.5*0.5) + 5*(0.1*0.1)} = 3.33$$

(Avg per day)

This is the same as the '(Avg per day)' statistic above except it is calculated based on the effective instruments traded on a daily basis over the reporting period and then averaged.

Intraday Volume Profile Chart

Chart showing the sum of the value traded on the venue intraday (in hourly intervals).

Trade Size Distribution Chart

Chart showing the total value of trades of different sizes (in EUR) i.e. €0-€1,000, €1,000 – 5,000 etc.

On Book Spread Histograms

These two charts show the distribution (trade count) of EVBBO spreads (exact time) at the time of each trade. One chart focuses on EVBBO spreads in the range 0-50BPS the second shows a larger 0-300BPS range.

Country (ISIN) Traded Chart.

This chart gives a breakdown of the total value traded (in EUR) by instruments from different *countries*. Country is based on the first two characters of the instrument's ISIN code.

Average Trade Size (EUR) by Country Chart

This chart shows the average value traded (in EUR) for trades split by their ISIN derived country over the reporting period.