



## LiquidMetrix Guide to European Dark Pools – June 2016

## Key Points

- This guide contains information on the following dark pools: BATS (BXE), BlockMatch™, BATS (CXE), Liquidnet, Nordic@Mid, POSIT, Six Swiss Exchange Liquidnet Service, SG CIB AlphaY, 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 June 2016 a total value of **EUR 97.90bn** was traded on the Dark Pools included in this guide.

Some brief statistics:

- Overall an average price improvement of **13.68 BPS** representing **EUR 133.93m** 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).

	BXE Dark	BlockMatch	CXE Dark	Liquidnet	Nordic@Mid	POSIT	SG CIB AlphaY	SLS	Turquoise Dark	UBS MTF
% Illiquid on Lit	0.65%	0.93%	0.45%	61.53%	1.40%	16.28%	0.16%	9.85%	0.88%	0.17%
% inside EVBBO*	99.87%	99.95%	99.89%	100.00%	99.87%	99.74%	99.97%	100.00%	99.87%	99.99%
% outside EVBBO*	0.13%	0.05%	0.11%	0.00%	0.13%	0.26%	0.03%	0.00%	0.13%	0.01%
% at EBBO Mid*	56.93%	28.97%	56.26%	63.45%	63.49%	31.90%	27.44%	85.84%	54.99%	38.88%
Arbitrage v MTF	0.003 BPS	0.000 BPS	0.003 BPS	0.000 BPS	0.001 BPS	0.003 BPS	0.000 BPS	0.000 BPS	0.002 BPS	0.000 BPS
<b>Avg Onbook Spread</b>	<b>12.81 BPS</b>	<b>12.38 BPS</b>	<b>11.60 BPS</b>	<b>217.59 BPS</b>	<b>22.48 BPS</b>	<b>47.10 BPS</b>	<b>8.44 BPS</b>	<b>150.24 BPS</b>	<b>12.77 BPS</b>	<b>8.81 BPS</b>
Avg Improvement	6.41 BPS	6.19 BPS	5.80 BPS	108.80 BPS	11.24 BPS	23.55 BPS	4.22 BPS	75.12 BPS	6.38 BPS	4.41 BPS
Worst Case Spread Capture **	32.11%	14.00%	33.17%	43.04%	41.59%	18.80%	14.45%	42.23%	29.07%	21.30%
<b>Value Traded</b>	<b>€12,147 m</b>	<b>€ 5,881 m</b>	<b>€ 20,436 m</b>	<b>€ 5,455 m</b>	<b>€247 m</b>	<b>€ 11,686 m</b>	<b>€1,680 m</b>	<b>€227 m</b>	<b>€ 17,179 m</b>	<b>€ 22,961 m</b>
No of trades	1,666,122	617,426	2,752,162	6,054	36,354	552,276	283,942	772	2,166,279	3,449,493
<b>Avg Trade Size</b>	<b>€ 7,290</b>	<b>€ 9,525</b>	<b>€ 7,425</b>	<b>€901,008</b>	<b>€6,781</b>	<b>€ 21,161</b>	<b>€5,096</b>	<b>€294,615</b>	<b>€ 7,930</b>	<b>€ 6,656</b>
Instruments Traded	2,120	1,673	2,137	1,109	372	1,742	974	59	1,809	1,997
(Avg p.d)	(1,304)	(795)	(1,359)	(129)	(125)	(902)	(225)	(8)	(1,211)	(1,306)
Eff Instruments	84.5	58.8	95.1	92.2	51.3	93.8	68.7	15.3	85.9	87.0
(Avg p.d)	(61.1)	(37.1)	(71.8)	(19.6)	(19.8)	(48.8)	(12.2)	(3.1)	(66.1)	(67.7)
Fees	0.15 BPS	n/a	0.30 BPS	n/a	n/a	n/a	n/a	1.00 BPS	0.30 BPS	0.10 BPS
	0.05BPS (self cross)		0.15 BPS (non IOC/ FOK)							
Cleared / Counterparty	Yes CCP=Multiple	No Bilateral	Yes CCP=Multiple	Bilateral/ CCP=SIXx-clear	CCP/ Bilateral	n/a n/a	No Bilateral	Yes CCP=Multiple	Yes CCP=Multiple	Yes CCP=Multiple

\*Based on value traded

\*\* For dark pools that include bid/offer matches, this statistic is not relevant, see Methodology.

The LiquidMetrix Guide to European Dark Pools and data for Turquoise, BATS Europe and Chi-X Europe is supplied by LiquidMetrix.

**LiquidMetrix**  
Best Execution, Quantified

LiquidMetrix is the suite of software services focussing on execution quality, transaction cost analysis, SOR analysis, best execution compliance and pre-trade cost prediction offered by Intelligent Financial Systems.

For more information contact: liquidmetrix@if5.com

## BXE Dark Book

Operated By	BATS Europe
Location	London Docklands
Market Model	<b>Continuous Mid Point Matching</b> Orders are automatically cancelled at the end of the trading day.
Reference price	Primary venues (PBBO)
Order Types	- Market order - Limit order - Midpoint Peg - Inter Dark Book Sweep BXE and CXE Dark Book - Dark Lit Sweep BXE Dark Book and BXE Lit Book or CXE Dark Book and CXE Lit Book - Time in Force (DAY,GTD,IOC) - MAQ Behaviour Various single fill and multiple fill options available
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 or preferred CCP: EuroCCP, LCH, SIX x-clear For Ireland: LCH, EuroCCP, x-clear
Connectivity	Extranet Point to Point Cross Connect Co-Location Service Bureau
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	<a href="http://www.batstrading.co.uk/features">www.batstrading.co.uk/features</a>
Fees	0.15 BPS
Contact	<a href="mailto:SalesEurope@batstrading.com">SalesEurope@batstrading.com</a> +44 207 012 8906

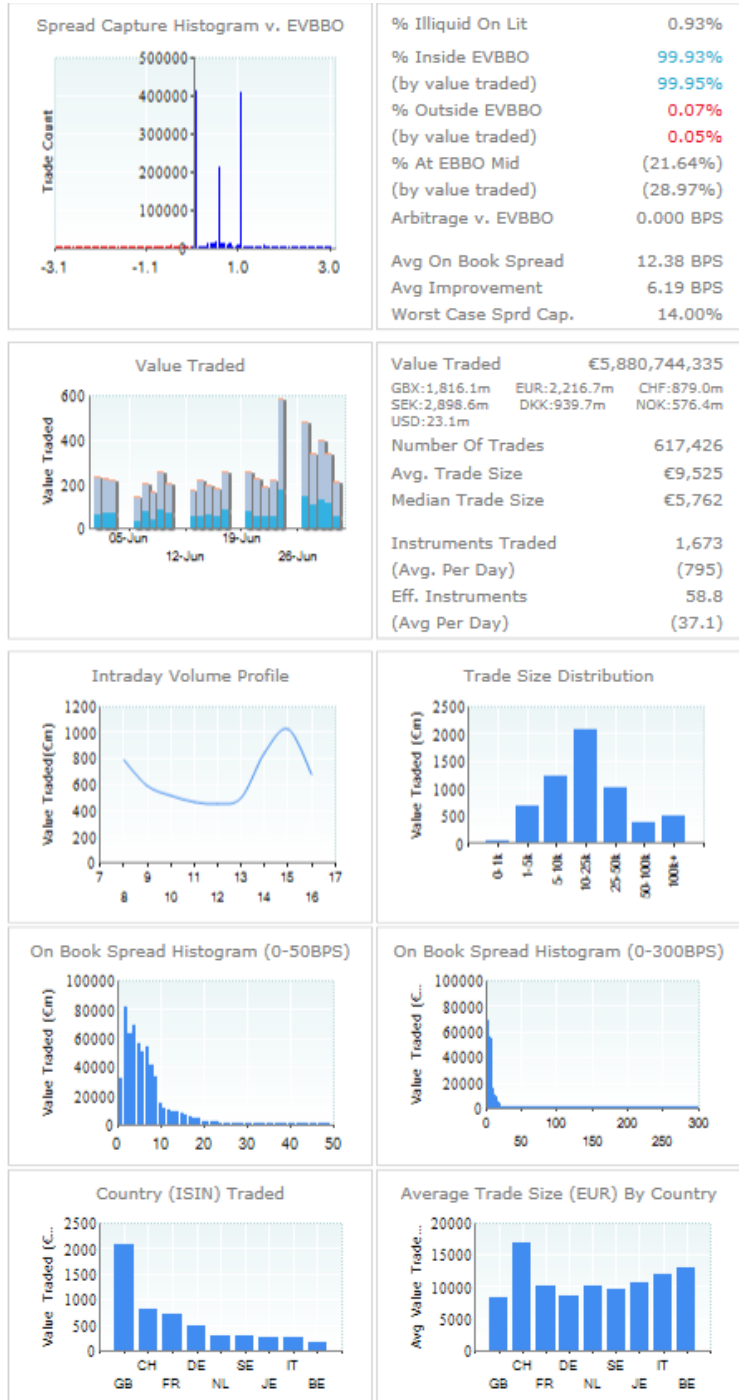
## BXE Dark Book



## BlockMatch™

Operated By	Instinet Europe Limited
Location	London
Market Model	<b>Continuous Mid Point, Bid or Offer Matching</b>
Reference price	EBBO For more details see <a href="http://www.blockmatch.com">www.blockmatch.com</a>
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 BATS Europe.
Website	<a href="http://www.blockmatch.com">www.blockmatch.com</a>
Fees	Not disclosed
Contact	26 <sup>th</sup> Floor, 25 Canada Square, London, E14 5LB +44 207 154 8400
Launched	July 2008

## BlockMatch™

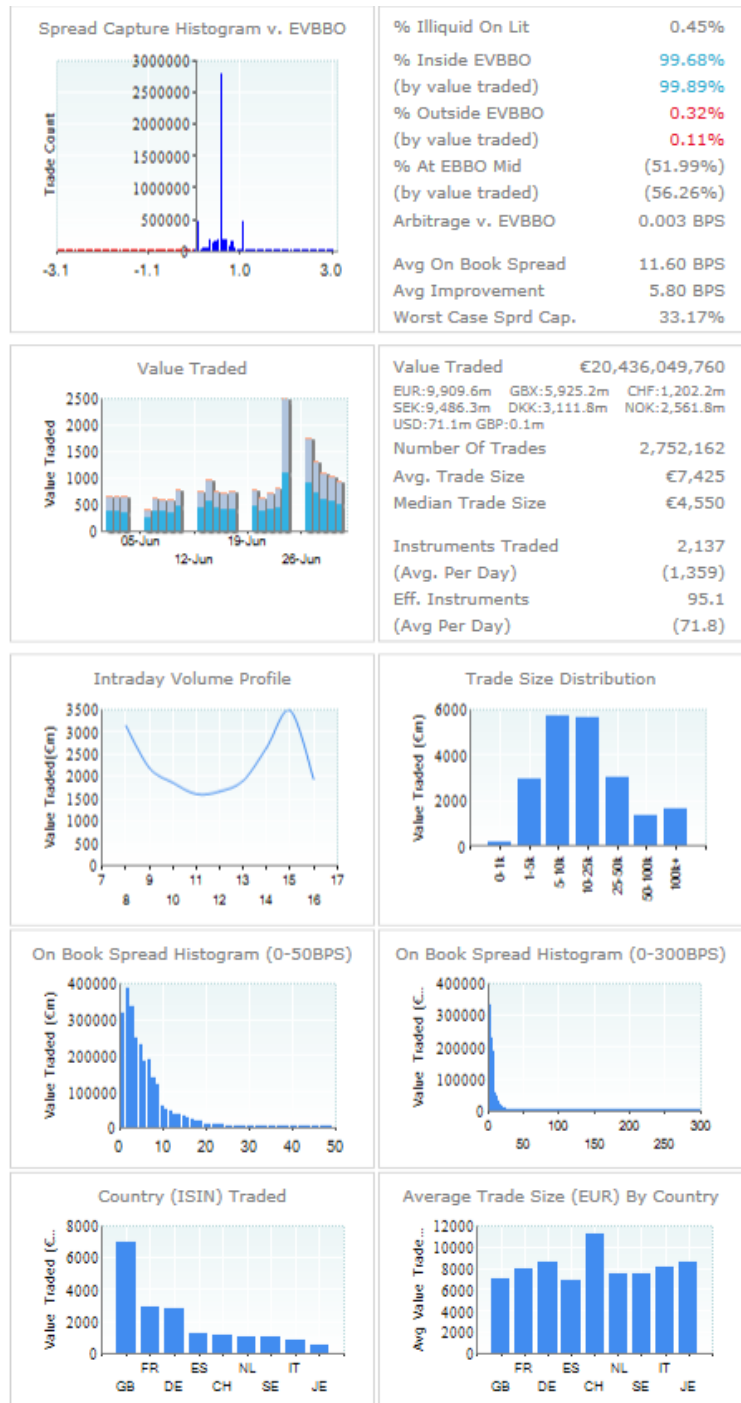


Note, BlockMatch is using an EBBO mid price rather than a primary mid price from 16th February 2012. BlockMatch is also offering the choice of using a Mid, Bid or Offer book since April 2012.

## CXE Dark Book™

Operated By	BATS Europe
Location	London
Market Model	<b>Continuous Mid Point Matching</b> 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 - Midpoint Peg - Inter Dark Book Sweep BXE and CXE Dark Book - Dark Lit Sweep BXE Dark Book and BXE Lit Book or CXE Dark Book and CXE Lit Book - Time in Force (DAY,GTD,IOC) - MAQ Behaviour Various single fill and multiple fill options available
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 or preferred CCP: EuroCCP, LCH, SIX x-clear
Connectivity	Extranet Point to Point Cross Connect Co-Location Service Bureau
Data	Trades are reported immediately on the CHI-X market data feed.
Website	<a href="http://www.batstrading.co.uk">www.batstrading.co.uk</a>
Fees	Non-IOC 0.15bps, IOC 0.3bps
Contact	6 <sup>th</sup> Floor, Lower Thames Street London, EC3R 6AF +44 207 131 3333

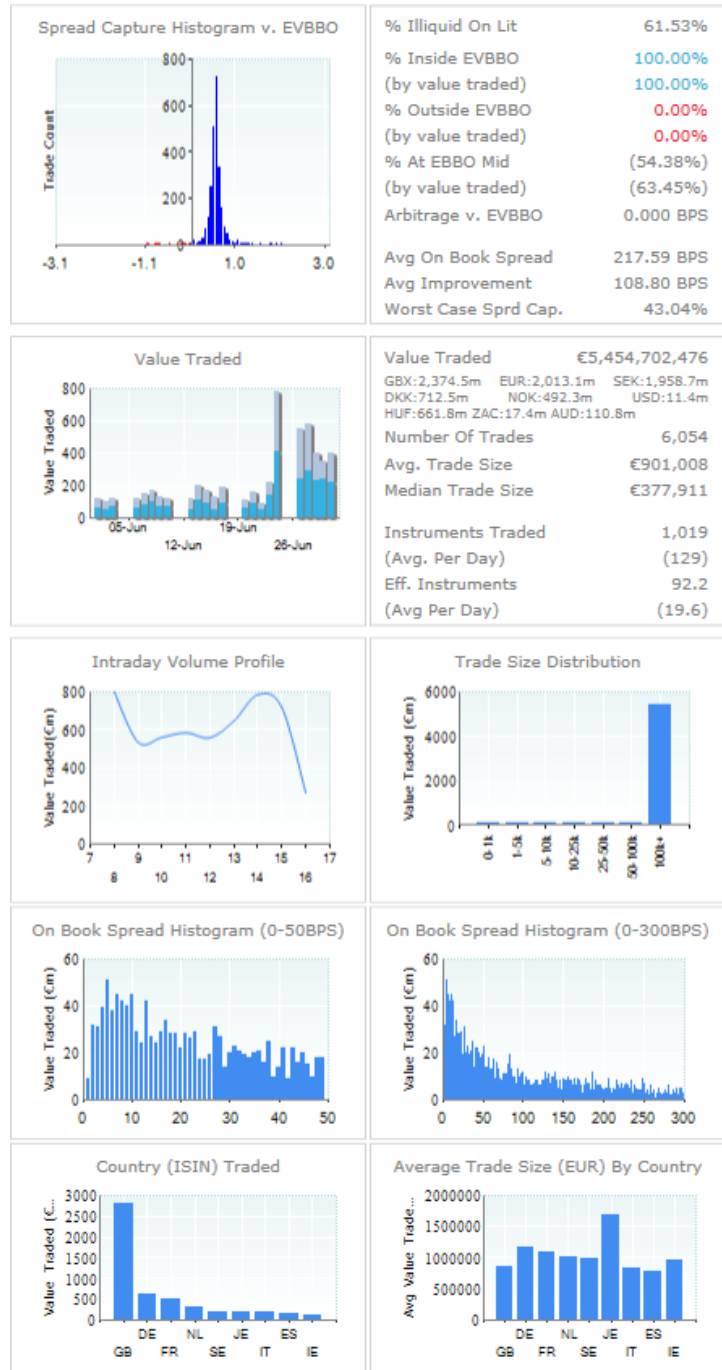
## CXE Dark Book™



## 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. (trading outside of market hours in certain markets)																												
Stock coverage	39 markets worldwide; 27 European markets:																												
	<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>Luxemburg</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> <p>12 markets in the Americas, APAC and South Africa.</p>	Austria	Israel	Belgium	Italy	Cyprus	Latvia	Czech Rep	Lithuania	Denmark	Luxemburg	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	Luxemburg																												
Estonia	Norway																												
Finland	Poland																												
France	Portugal																												
Germany	Slovenia																												
Greece	Spain																												
Holland	Sweden																												
Hungary	Switzerland																												
Iceland	UK																												
Ireland																													
Users	Approved clients of Liquidnet																												
Settlement / Clearing	Bilateral settlement model for buy-side institutions, CCP relationship with SIX X-Clear; clearing available for Brokers / MTFs who have membership with additional CCPs.																												
Connectivity	FIX, Customer OMS Integration																												
Data	Trades are reported to BATS Europe.																												
Website	www.liquidnet.com																												
Fees	Not disclosed																												
Contact	21st Floor, Broadgate Tower, Primrose Street, Bishopsgate, London, EC2A 2EW +44 (0)20 7614 1653 pmcstay@liquidnet.com																												
Launched	2002																												

## Liquidnet



## Nordic@Mid

Operated By Nasdaq OMX  
Location Stockholm/Helsinki/Copenhagen/Iceland

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

Reference price Primary venues (PBBO)

Order Types - Mid-point pegged order

Parameters:  
- Time in force IOC, GTT, Good-till-market close  
- Min Acceptable Quantity (MAQ)  
- Internal (self cross), Size-Time matching

Hours Same as NASDAQ OMX primary markets.

Stock coverage European countries  
Sweden  
Finland  
Denmark  
Norway  
Iceland

Users Members of NASDAQ OMX.

Settlement / Clearing

Connectivity EMCF or bilateral connectivity  
FIX via network vendors

Data Executions flagged with trade type 'S' are disseminated immediately via the Nordic Equity TotalView-ITCH market data feed.

Website [www.nasdaqomx.com/darkpool](http://www.nasdaqomx.com/darkpool)

Fees According to normal lit trading fee (aggressive)

Contact [nordicsalesteam@nasdaqomx.com](mailto:nordicsalesteam@nasdaqomx.com)

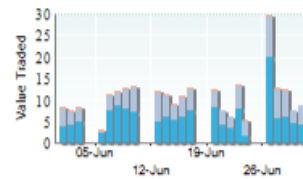
## Nordic@Mid

Spread Capture Histogram v. EVBBO



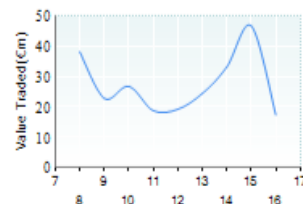
% Illiquid On Lit	1.40%
% Inside EVBBO (by value traded)	99.71%
% Outside EVBBO (by value traded)	0.29%
% At EBBO Mid (by value traded)	(58.50%)
Arbitrage v. EVBBO	0.001 BPS
Avg On Book Spread	22.48 BPS
Avg Improvement	11.24 BPS
Worst Case Sprd Cap.	41.59%

Value Traded

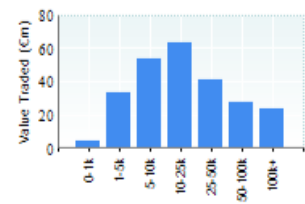


Value Traded	€246,532,046
SEK:1,284.3m	DKK:513.3m
NOK:17.5m	EUR:37.2m
Number Of Trades	36,354
Avg. Trade Size	€6,781
Median Trade Size	€2,709
Instruments Traded (Avg. Per Day)	372 (125)
Eff. Instruments (Avg Per Day)	51.3 (19.8)

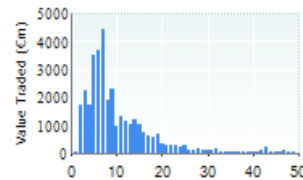
Intraday Volume Profile



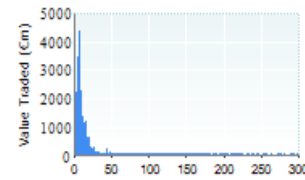
Trade Size Distribution



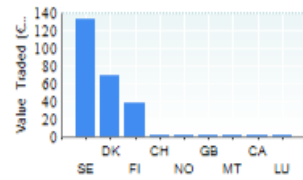
On Book Spread Histogram (0-50BPS)



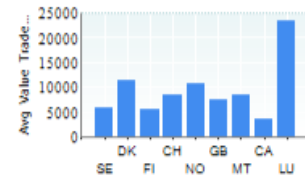
On Book Spread Histogram (0-300BPS)



Country (ISIN) Traded



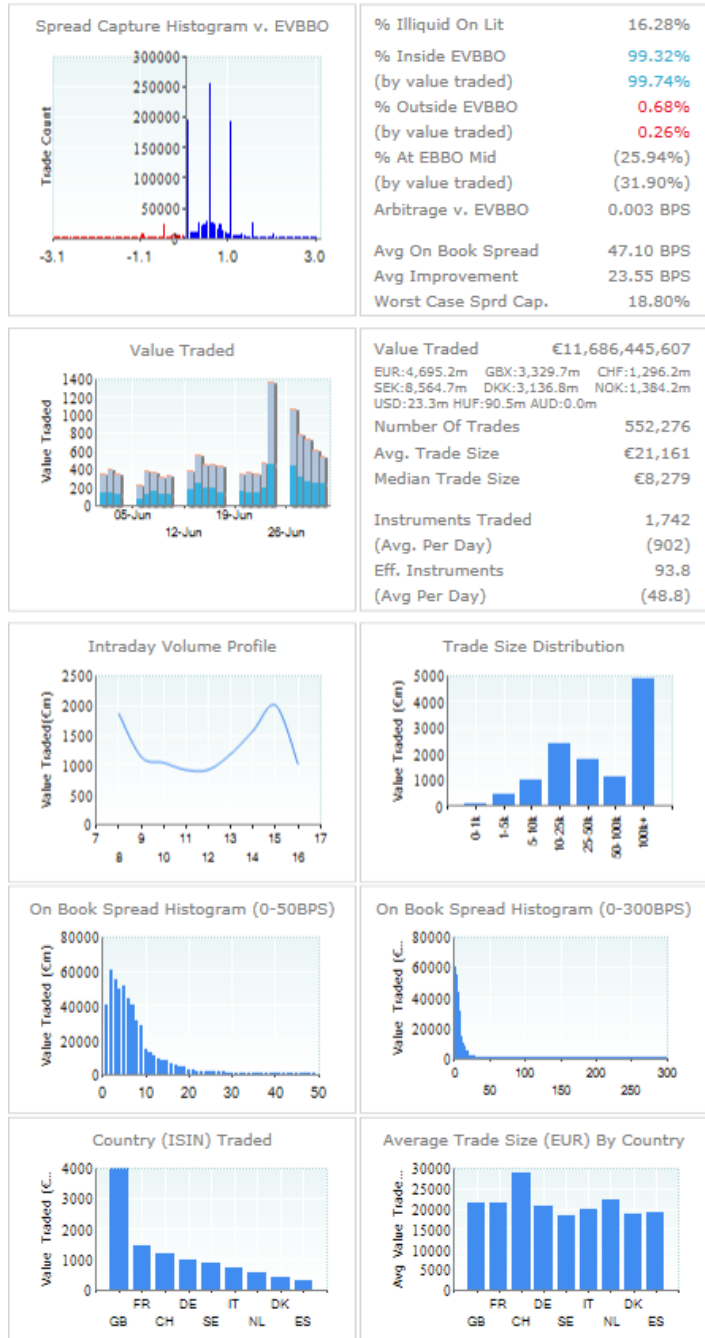
Average Trade Size (EUR) By Country



## POSIT

Operated By	ITG (Investment Technology Group Europe Ltd.)
Location	London
Market Model	<b>POSIT Now™: Continuous Mid Point Matching</b> Orders are matched continuously pro rata unless a minimum quantity is set
Reference price	Primary venues (PBBO)
Order Types	- Market order - Limit order  Parameters: - Min Quantity (MAQ)
Hours	Same as primary markets. 08:00 – 16:30 (UK time)
Stock coverage	21 European countries Austria Ireland Belgium Israel Cyprus Italy Czech Rep Norway Denmark Portugal Finland South Africa France Spain Germany Sweden Greece Switzerland Holland UK Hungary  Stocks Supported: 14,091
Users	Institutional buy and sell sides.
Settlement / Clearing	
Connectivity	FIX connectivity or ITG front ends: Triton, Channel ITG
Data	Trades are reported to BATS Europe.
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	February 2007

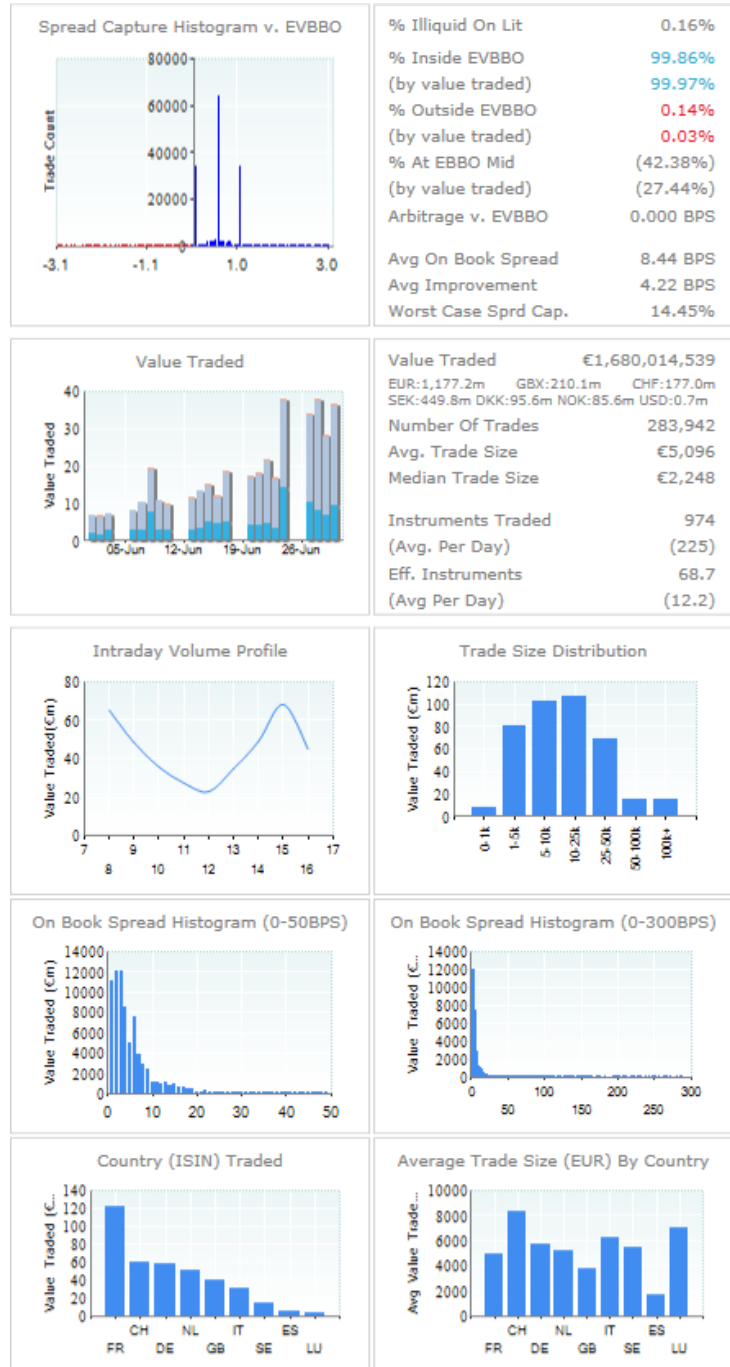
## POSIT



## SG CIB AlphaY

Operated by	SGB CIB
Location	London
Market Model	Continuous mid-point matching at EBBO with priority given to client crossing Closing auction matching at close price of primary
Reference Price	EBBO (Primary, Chi-X, Turquoise, Bats, Burgundy)
Order types	- Market - Limit - IOC, FOK  Parameters: - min quantity (MAQ) - min execution size (MES) - peg (mid, near touch, far touch)
Hours	Same as primary market continuous trading
Stock Coverage	Austria Ireland Belgium Italy Denmark Norway Finland Portugal France Sweden Germany Switzerland Holland UK  Stocks supported: 4,500
Users	Institutional buy and sell sides
Settlement / Clearing	Bilateral
Connectivity	FIX connectivity or FIX-enabled vendor systems
Data	Trades are reported to: - Euronext (for Euronext listed stocks) - SIX (for SIX listed stocks) - LSE (for all other stocks)
Contact	Societe Generale CIB Exchange House, Primrose Street London EC2A 2HT eur.ges@sgcib.com +44 20-7762-5751
Launched	April 2012

## SG CIB AlphaY



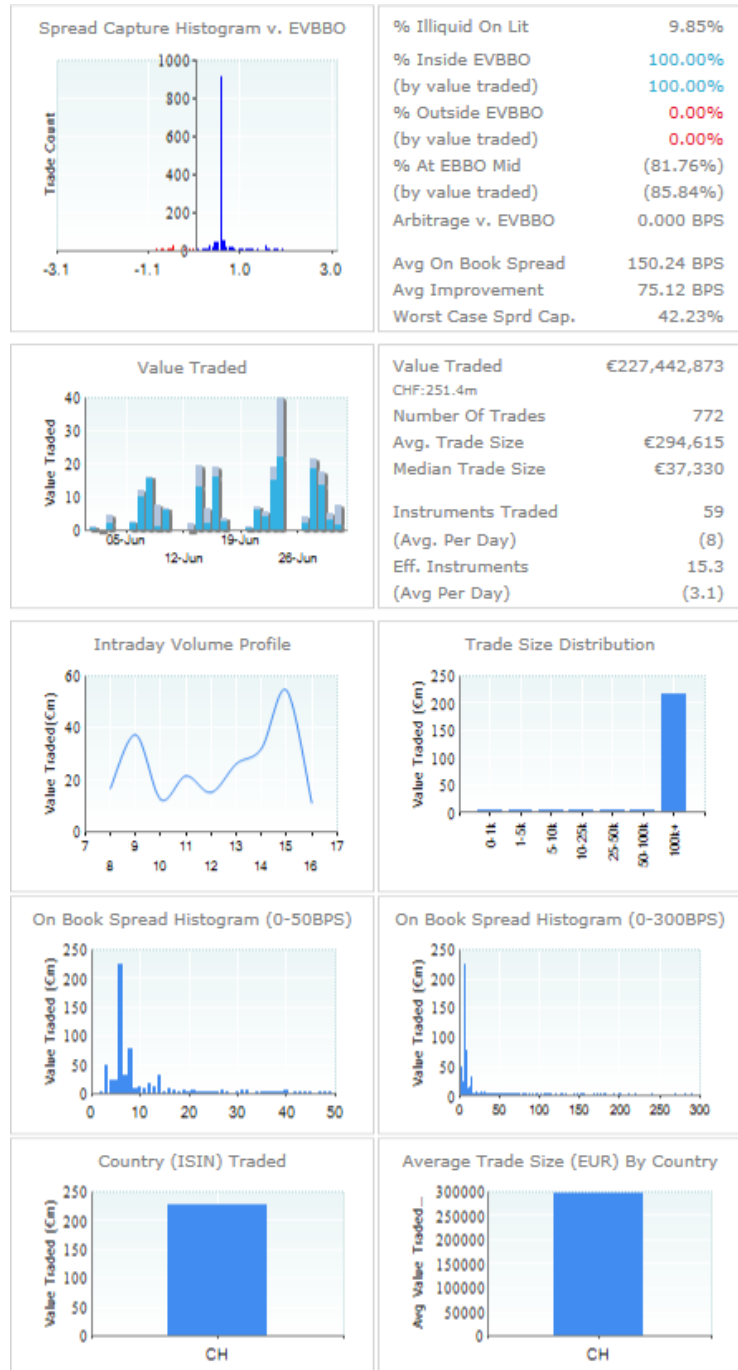
\* Value traded and number of trades incorporates both AlphaY and legacy venue crossing at close and primary BBO. All other figures are based on AlphaY pool only.



**SLS** (SIX Swiss Exchange Liquidnet Service)

Operated By	SIX Swiss Exchange in cooperation with Liquidnet Europe Ltd
Location	Switzerland
Market Model	Automatic mid-point matching SLS provides access to Liquidnet’s institutional buy- and sell-side liquidity. Each participant can opt in and opt out to interact with buy-side liquidity.
Reference price	Primary venue
Order Types	- Market order - Limit order Parameters: - Min. Quantity
Hours	Same as continuous trading on primary markets
Stock coverage	11 European countries  Austria Netherlands Belgium Portugal Denmark Sweden Finland Switzerland France United Kingdom Germany
	Over 3,800 stocks
Users	All members of Six Swiss Exchange and their clients.
Settlement / Clearing	CCP relationship with SIX x-clear or LCH Settlement: T+2
Connectivity	Via FIX based STI (Standard Trading Interface) Connection
Data	Data feed available via the SIX Swiss Exchange market data Executions are immediately published post trade
Website	<a href="http://www.six-swiss-exchange.com/sls">http://www.six-swiss-exchange.com/sls</a>
Fees	1 bp for all markets
Contact	Equity.Products@six-swiss-exchange.com
Launched	July 2011

**SLS**

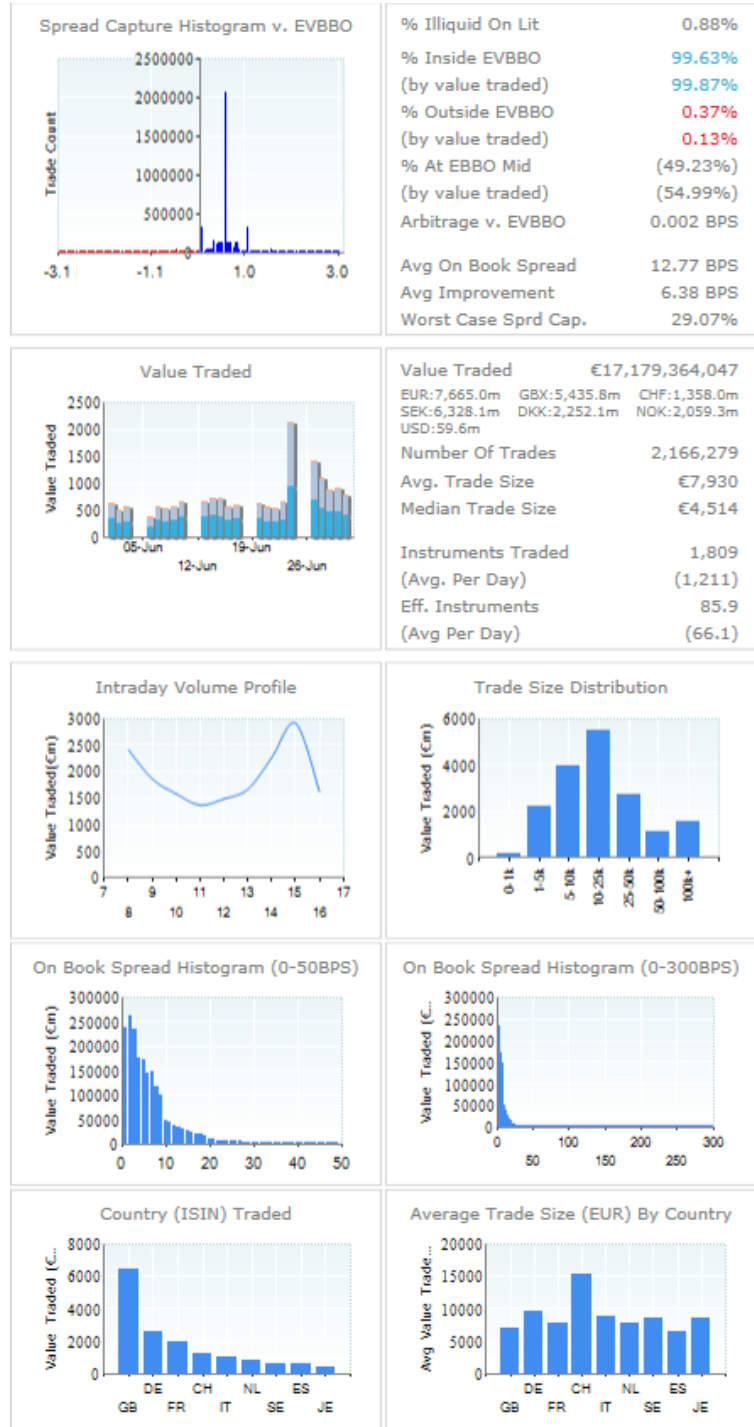


\*Only CHF trades are included in this analysis.

## Turquoise Dark

Operated By	Turquoise (London Stock Exchange Group)																
Location	London																
Market Model	<ul style="list-style-type: none"> <li>- Continuous Mid Point Matching</li> <li>- Ability to opt-out of interacting with IOC via Randomised Periodic Matches</li> </ul> <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"> <li>- Market order</li> <li>- Limit order</li> <li>- Pegged order</li> </ul> <p>Parameters:</p> <ul style="list-style-type: none"> <li>- Time in force (GTD, DAY, IOC, FOK, FAK)</li> <li>- Peg cap/Floor</li> <li>- Min Acceptable Quantity (MAQ)</li> </ul> <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	
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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 (for Spanish, US, ETF only) or preferred CCP: EuroCCP, LCH.Clearnet, SIX x-clear																
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																

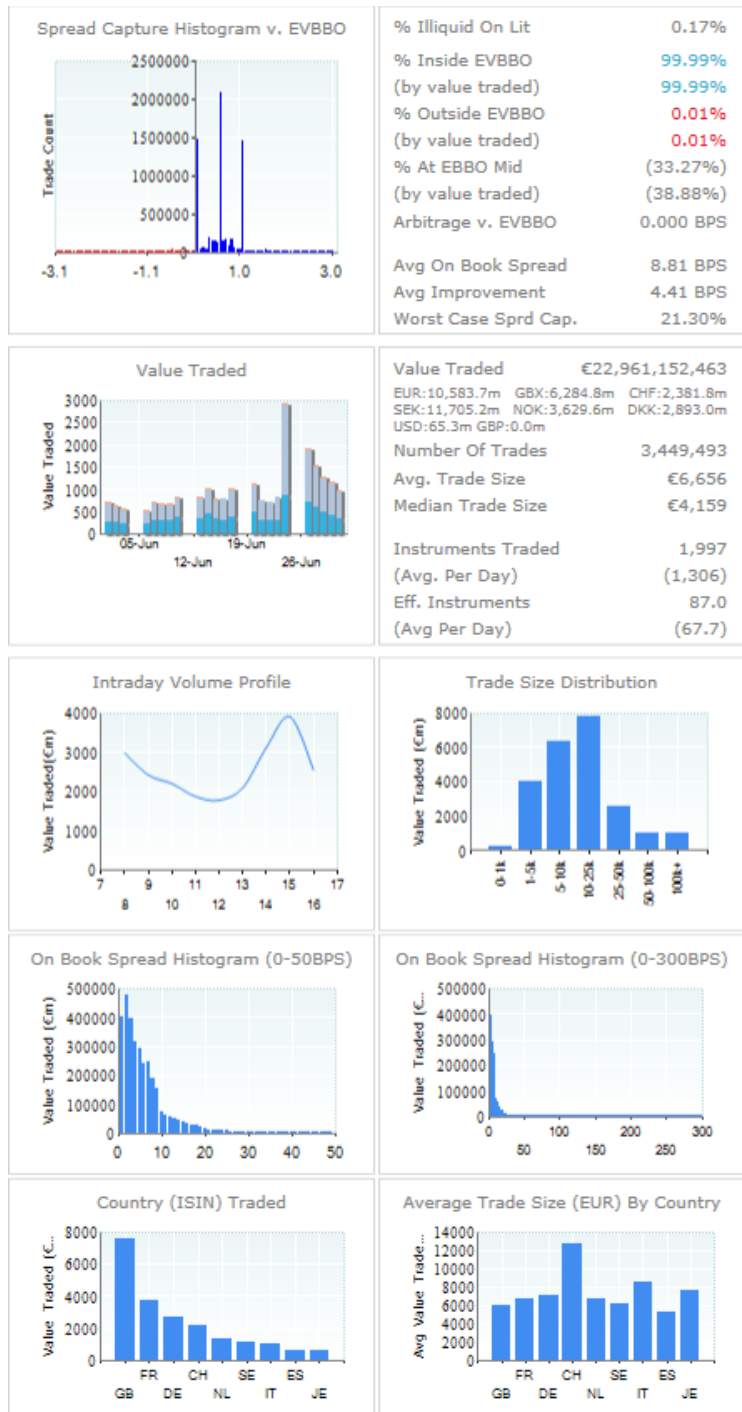
## Turquoise Dark



## UBS MTF

Operated By	UBS
Location	London
Market Model	Mid point matching using price time priority. Also matching on primary bid or offer.
Reference price	Primary market PBBO
Order Types	- Market order - Limit order - Pegged order (Day or IOC) Min order size: 1 and Members have choice to set MAQ (Minimum Acceptable Quantity)
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	16 European countries Austria Hungary Czech Rep Ireland Belgium Italy Denmark Norway Finland Portugal France Sweden Germany Switzerland Holland UK Depository Receipts: UBS MTF has matched International Depository Receipts with underlyings of another 12 countries of which most are Russian DRs.
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 or EuroCCP) used by UBS MTF or have access via a GCM (General Clearing Member). Potential to add EMCF and LCH.clearnet subject to regulatory approval.
Connectivity	FIX 4.2
Data	Trades are reported to BATS Europe.
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



Note, values are based on midpoint matched trades as well as trades executed at primary bid or offer.

## 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 bid 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. For the purpose of this statistic we exclude primary venues from EVBBO as matches on Dark Pools are implicitly at the mid-point of the primary venue.

**Arbitrage v. MTF (EVBB0)**

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 an **MTF venue (i.e. not a primary)**. 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 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 **Worst Case Spread Capture**, which is calculated for each trade as Worst Case Improvement / On Book Spread and shown as a percentage. For a midpoint matching dark pool the closer this figure is to 50%, the 'fairer' the matched prices are. For dark pools that include bid or offer matches this figure is not really relevant as for bid and offer matches the 'loser' gets an expected spread capture of 0%, skewing the results to be closer to 0%.

**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 EBB0 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.