

August 2023

MICROSTRUCTURE OBSERVATIONS

- In August 2023, the average daily volume in EMEA equities decreased to €31.4B, 10% lower than the previous month, and 9.5% below August 2022 volume.
- The median quote size at the European Best Bid and Offer (EBBO) in August 2023 decreased for STOXX 50 by 3% and decreased for STOXX 600 by 15% during the intraday trading period (08:30 to 16:00 GMT) compared to the previous month.
- Median quoted spreads at the EBBO in STOXX50 increased 5% MoM and STOXX 600 symbol spreads increased 2% MoM, during the intraday trading period.
- Volatility levels increased significantly in August 2023 compared to the previous month, with STOXX 50 increasing 22% MoM and STOXX 600 volatility increasing 13% MoM, during intraday trading.
- The market share distribution between venue types changed slightly in August 2023 compared to the previous month and Primary Auctions increased 2% MoM. Dark venues' market share decreased by 1% to 9.6%, Lit MTF market share decreased by 0.6% and Frequent Batch Auctions ("FBA") venues' market share decreased by 0.3%.
- Dark market share between venues changed slightly in August 2023 compared to the prior month, with Aquis, Turquoise and Liquidnet gaining 1%, Cboe losing 2%, and Instinet Blockmatch losing 1%.
- Block market share distribution fluctuated in August 2023 compared to previous month. Liquidnet gained 3%, Turquoise gained 1%, Other small venues lost 3% and Cboe lost 1%.
- In August 2023, closing auction volume decreased slightly from the record highs of June 2023. As a percentage of the daily volume relative to the prior month, STOXX50 closing auction volume was down 1.3% to 28.6% and STOXX600 was down 1.2% to 31.2%.

EMEA MARKET STRUCTURE NEWS

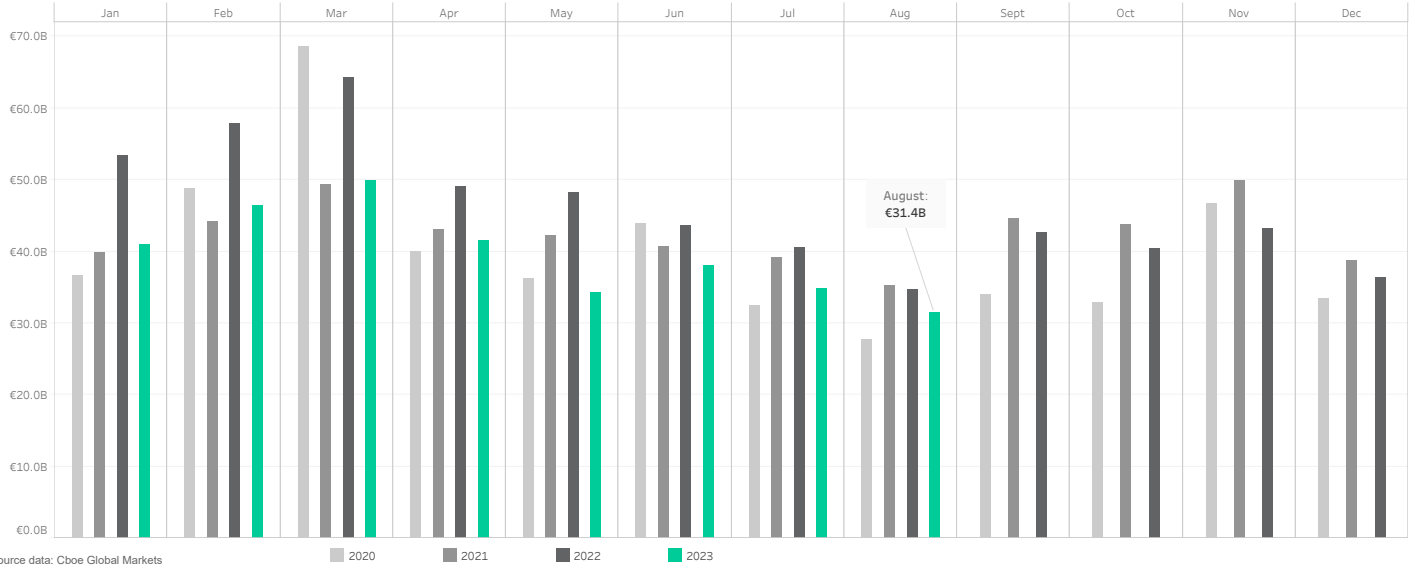
[Bank of England Warns of Fragility in Deep Learning Models](#)

The Bank of England working paper tested the stability of predictions and explanations of different deep learning models which are being utilized increasingly within finance. The Bank of England found that deep learning based artificial neural network models have high accuracy but a poor capacity for explainability. This characteristic makes deep learning models a challenge for institutions who need transparency, robustness, and regulatory compliance from the tools used to support decision-making. The Bank of England made further recommendations for deep learning model developers.

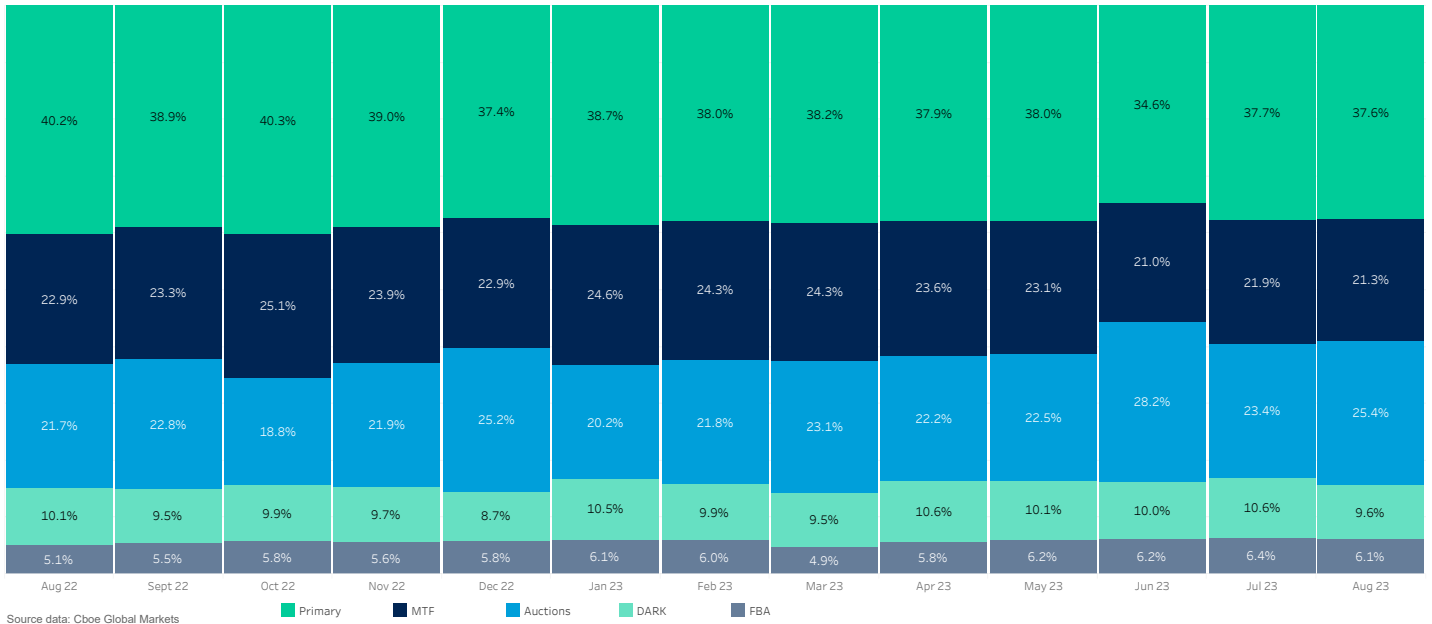
[Financial Conduct Authority Provides Updates on Wholesale Data Market Study](#)

The UK Financial Conduct Authority (FCA) said it continues to identify any harm in the market and where appropriate, potential ways to address it. The FCA received 28 responses to its initial request to participate in the wholesale data market consultation. Areas reviewed included benchmark administrators, credit rating data and Market Data Vendors services (MDVs). The FCA's update highlights features which either alone or in combination, prevent, restrict, or distort competition. With regards to credit rating, the FCA says that based on its analysis so far, it has identified potential competition concerns; however, the scale of the suspected problem is currently unclear and further analysis will be required. Lastly while identifying competition concerns in benchmark markets, it is currently unclear if and how far the issues lead to a significant adverse effect on competition.

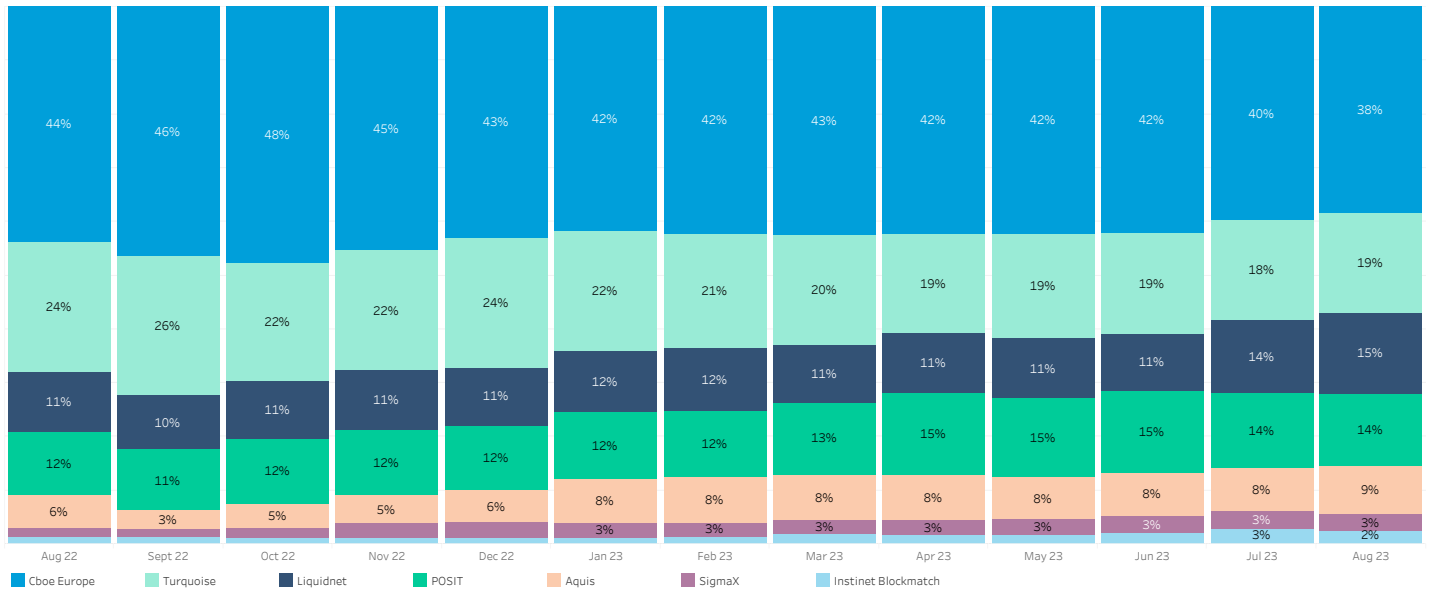
Average Daily Market Volume



Venue Type Market Share

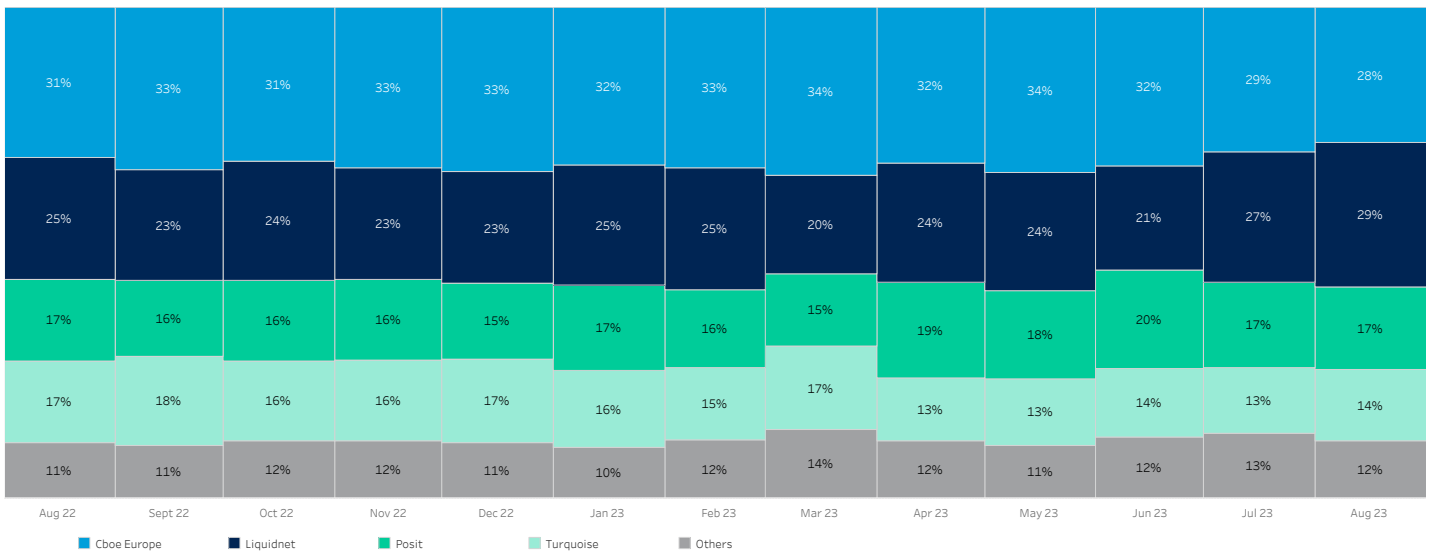


European Dark Market Share



Source data: Cboe Global Markets

European Block Market Share



Large In Scale values as per defined per symbol by ESMA; Source data: Virtu Financial

Quotesize in Notional USD

		3Q 22		4Q 22			1Q 23			2Q 23			3Q 23	
		Aug 22	Sept 22	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	Apr 23	May 23	Jun 23	Jul 23	Aug 23
8:00 - 8:30	Stoxx50	19.2K	18.3K	18.0K	23.6K	25.9K	29.8K	32.1K	27.7K	31.3K	29.3K	25.8K	28.2K	27.3K
	Stoxx600	10.3K	11.1K	9.9K	10.8K	12.3K	13.7K	14.1K	14.5K	15.2K	14.3K	13.5K	12.7K	11.0K
8:30 - 16:00	Stoxx50	26.6K	25.8K	25.1K	34.3K	35.4K	40.6K	44.2K	38.5K	42.1K	39.4K	34.2K	38.8K	37.9K
	Stoxx600	12.2K	13.4K	11.5K	13.0K	14.9K	16.7K	17.4K	18.1K	19.1K	18.0K	17.6K	16.8K	14.4K
16:00 - 16:30	Stoxx50	31.4K	29.0K	28.8K	40.9K	42.2K	49.1K	47.8K	45.3K	49.5K	47.3K	41.8K	46.8K	44.7K
	Stoxx600	14.7K	15.0K	13.8K	16.6K	18.6K	20.2K	21.3K	22.4K	24.1K	23.4K	23.3K	22.5K	18.7K

Spread Bps

8:00 - 8:30	Stoxx50	4.9	5.2	5.2	4.7	4.7	4.7	4.5	5.0	5.4	5.5	5.3	5.3	5.3
	Stoxx600	9.1	9.4	9.8	9.0	8.7	8.3	7.7	8.4	8.3	8.4	8.0	8.1	8.6
8:30 - 16:00	Stoxx50	3.2	3.5	3.4	3.1	3.1	3.2	3.0	3.3	3.4	3.4	3.3	3.4	3.6
	Stoxx600	5.4	5.9	6.0	5.3	5.1	4.9	4.9	5.4	5.1	5.1	5.0	5.1	5.2
16:00 - 16:30	Stoxx50	2.7	2.9	2.8	2.6	2.8	2.8	2.6	2.9	3.1	3.1	3.1	3.1	3.4
	Stoxx600	4.5	4.8	4.9	4.3	4.4	4.1	4.2	4.6	4.5	4.4	4.5	4.5	4.6

One Minute Volatility Bps

8:00 - 8:30	Stoxx50	14.2	17.1	16.9	13.4	11.5	11.6	12.4	14.1	12.3	12.4	11.4	11.4	12.5
	Stoxx600	13.8	16.9	17.4	14.8	12.2	12.0	11.4	12.8	11.7	11.1	10.2	10.4	10.9
8:30 - 16:00	Stoxx50	6.6	8.7	8.1	5.9	5.0	5.4	5.5	6.9	5.5	5.1	5.1	5.0	6.1
	Stoxx600	5.9	7.4	7.6	6.0	5.0	4.9	4.9	6.0	4.8	4.6	4.5	4.5	5.1
16:00 - 16:30	Stoxx50	6.9	8.5	8.5	6.0	5.5	5.6	5.7	6.6	5.9	5.7	5.8	5.2	6.3
	Stoxx600	5.4	6.8	7.0	5.4	4.8	4.6	4.7	5.1	4.5	4.5	4.4	4.2	4.7

Percent ADV by Time of Day

Open	Stoxx50	0.7%	0.7%	0.7%	0.7%	0.9%	1.1%	1.0%	1.0%	1.0%	1.0%	1.1%	1.1%	1.3%
	Stoxx600	0.4%	0.4%	0.3%	0.4%	0.4%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%	0.6%
8:00 - 8:30	Stoxx50	10.9%	11.5%	11.6%	10.1%	7.1%	6.4%	5.9%	4.8%	2.9%	3.4%	3.0%	3.6%	3.8%
	Stoxx600	7.2%	7.9%	7.8%	7.4%	6.5%	8.8%	8.3%	6.3%	6.5%	6.6%	5.7%	5.7%	6.1%
16:00 - 16:30	Stoxx50	12.3%	11.0%	12.2%	10.2%	6.9%	5.5%	3.3%	4.2%	2.0%	2.8%	2.9%	4.0%	3.6%
	Stoxx600	13.7%	12.9%	12.2%	11.8%	11.0%	13.1%	13.3%	13.2%	13.3%	13.9%	13.6%	14.0%	13.2%
Close	Stoxx50	22.2%	20.4%	18.1%	19.4%	23.5%	23.1%	25.7%	27.4%	26.6%	29.3%	33.0%	29.9%	28.6%
	Stoxx600	21.3%	20.5%	18.3%	18.6%	21.5%	25.8%	26.8%	29.7%	29.8%	30.6%	34.9%	32.4%	31.2%

Median used for all metrics
 One minute volatility is calculated using the difference between the high and low price within a one minute time bin, divided by that bin's VWAP
 Source data: Virtu Financial

ABOUT VIRTU

Virtu is a leading financial services firm that leverages cutting-edge technology to provide execution services and data, analytics and connectivity products to its clients and deliver liquidity to the global markets. Leveraging its global market making expertise and infrastructure, Virtu provides a robust product suite including offerings in execution, liquidity sourcing, analytics and broker-neutral, multi-dealer platforms in workflow technology. Virtu's product offerings allow clients to trade on hundreds of venues across 50+ countries and in multiple asset classes, including global equities, ETFs, foreign exchange, futures, fixed income and myriad other commodities. In addition, Virtu's integrated, multi-asset analytics platform provides a range of pre and post-trade services, data products and compliance tools that clients rely upon to invest, trade and manage risk across global markets.

To learn more, contact your sales representative or call our desk at:

APAC+852.2846.3553 | **CAN**+1.416.874.0800 | **EMEA**+44.20.7670.4066 | **US**+1.212.444.6250
info@virtu.com | www.virtu.com

© 2023 Virtu Financial, Inc. All rights reserved. Not to be reproduced or retransmitted without permission. These materials are for informational purposes and are not intended to be used to make trading or investment decisions, they are not intended as an offer to sell or the solicitation of an offer to buy any security or financial product, and are not intended as advice (investment, tax or legal). The information contained herein includes Virtu proprietary information and/or has been taken from sources we believe to be reliable, but we do not represent or warrant that such information is accurate or complete and it should not be relied upon as such.

Analytics products and services referenced herein may not be subject to oversight by regulatory authorities in one or more jurisdictions, including in Europe, Hong Kong or Australia, where such products and services are offered by Virtu ITG Ventures Limited, Virtu ITG Hong Kong Limited or Virtu ITG Australia Limited, registered in Ireland No. 295549 ("VIVL"), Hong Kong CE No. AHD810 ("VIHK") and Australia AFSL No. 219582 ("VIAU"), respectively. VIVL does not engage in regulated activity.

Securities products and services are offered by the following subsidiaries of Virtu Financial, Inc. In the U.S., Virtu Americas LLC, member FINRA and SIPC; in Canada, Virtu Canada Corp., member Canadian Investor Protection Fund and Canadian Investment Regulatory Organization; in Europe, Virtu Europe Trading Limited, registered in Ireland No. 283940 ("VETL") (VETL is authorized and regulated by the Central Bank of Ireland), and Virtu Financial Ireland Limited, registered in Ireland No. 471719 ("VFIL") (VFIL is authorized and regulated by the Central Bank of Ireland). The registered office of VETL and VFIL is North Dock One, Fifth Floor, 91-92 North Wall Quay, Dublin 1, Ireland, D01 H7V7; in Asia, Virtu ITG Hong Kong Limited (SFC License No. AHD810), Virtu ITG Singapore Pte Limited (CMS License No. 100138-1), and Virtu ITG Australia Limited (AFS License No. 219582).