

THE
2022
**ALGORITHMIC
TRADING
SURVEY**

LONG-ONLY

With special analysis from
Aite-Novarica Group

AiteNovarica

The ongoing evolution of the market is leading buy-side traders to want more

The long-only results of The TRADE's 2022 Algorithmic Trading Survey reach an all-time high, highlighting the continued evolution and improvement of the solutions being offered in the market. Yet buy-side traders still want more.

Last year was another wild one for the global equity markets, punctuated by disparate returns across asset classes. Equities continued their upward march, global bonds suffered as interest rates began to rise and commodity prices exploded upwards. The volatility in the market presented opportunities and new challenges for global traders. Ongoing remote working situations, meme stocks and volume spikes from individual investors added to the complexities of optimising liquidity. As we enter 2022, volatility has increased with geopolitical events and global inflationary concerns. All of which made the results of this year's Algorithmic Trading Survey and the factors impacting the use of algos, choice of algos and perceptions of the quality of execution, all the more timely.

Ratings from long-only survey respondents continued to

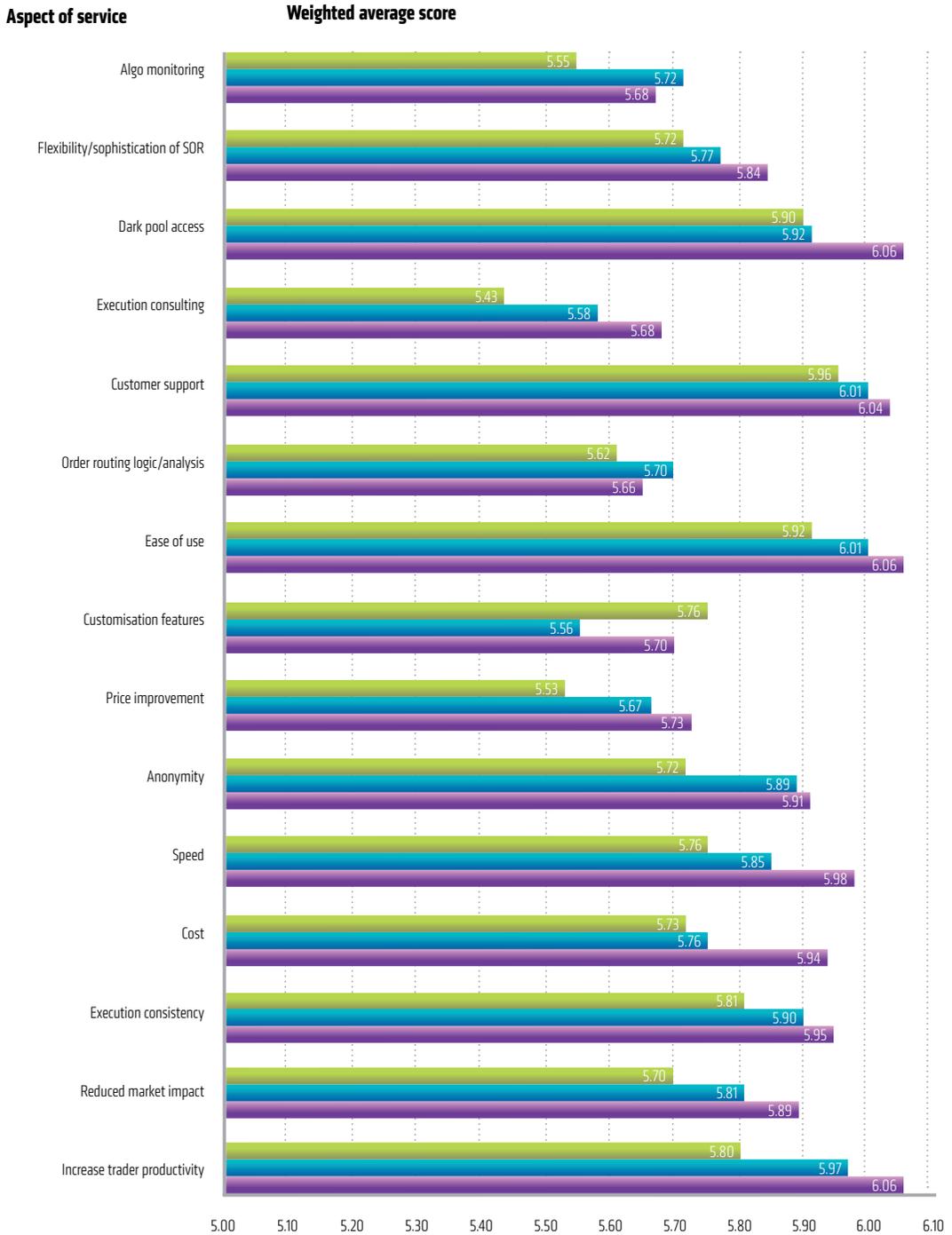
improve in this year's survey. Survey results show users of algorithms provided an overall rating of 5.88 in 2022, an increase over the 5.81 survey average in 2021, which was itself an improvement from the 2020 score of 5.71. In 2022, the most impactful features of algorithms mirrored the results from 2021 and were identified as ease of use, customer support and services, dark pool access, and increased trader productivity (Figure 1). The largest improvements in ratings were in the categories of cost, speed, customisation features and breadth of dark or alternative liquidity sources that are accessed. Data on venue/order routing logic or analysis and algo monitoring were the only two categories to experience year-over-year reductions, albeit minimal reductions at .04 for both. Between 2020 and 2022 the largest improvements in algo ratings have been seen in areas

of trader productivity (+.26), cost (+.22), speed (+.23) and execution consulting and pre-trade cost estimates (+.24), highlighting the continued evolution and improvement of the solutions being offered in the market.

With all that said, the ongoing evolution of the market is leading traders to want more. When asked what features and functions need to be added, the answers mirrored market evolutions. They want more control – All or None, GTC and different participation rates based on venue type. They want solutions that can help them trade at the close of the market or TAL (Trade at Last) strategies. They want more customisation, both firm-specific customisations and solutions designed to specialise in the needs of different markets, such as large cap and small cap. They want advice and guidance on how best to leverage the tools

Figure 1: Rating of algo performance

ALGO 2020 █
 ALGO 2021 █
 ALGO 2022 █



providers are putting in their hands and better solutions to measure the performance of those algorithms. It's a lot, but if past years are any indication, this set of providers is up to the challenge.

Respondents' reasons for using algos are presented in Figure 2 as a percentage of responses for the 2020-2022 survey results. Forty-six percent of the responses fall within the top four reasons for using algorithms: Ease of use, reduce market impact, increase trader productivity and consistency of execution performance. Over the years, responses are consolidating to those four categories, amounting to 43% of responses in 2021 and 42% in 2020. Those numbers were largely consistent across respondents of different AUM size. Perhaps not surprising, the largest discrepancy among firm size is in greater anonymity with respondents with more than \$50billion AUM rating anonymity at 8.72 as opposed to the broader average of 7.85.

The four areas that saw year-over-year decreases were anonymity, higher speed lower latency, lower commission rates and results that match pre-trade estimates. It's not that many of these are not important considerations, perhaps the ratings are reflective of expectations of these as table stakes in 2022. The ratings in 2022 seemed to reflect the current market dynamics, that respondents just wanted the trades done easily, at a fair price and with minimum impact.

It comes as no surprise that firms with larger AUM use

Figure 2. Reasons for using algorithms (% of responses)

Feature	2022	2021	2020
Ease of use	▲ 12.25	12.04	11.08
Reduce market impact	▲ 12.03	10.45	10.29
Increase trader productivity	▲ 10.87	10.32	10.45
Consistency of execution performance	▲ 10.74	10.19	10.51
Better prices (price improvement)	▲ 7.94	6.68	6.65
Greater anonymity	▼ 7.85	8.96	9.93
Flexibility and sophistication of sor	▲ 7.35	7.24	8.02
Higher speed, lower latency	▼ 6.87	7.64	6.56
Lower commission rates	▼ 6.77	8.69	6.83
Customisation capabilities	▲ 6.33	6.21	5.74
Algo monitoring capabilities	▲ 5.67	5.30	7.20
Data on venue/order routing logic or analysis	▲ 3.93	3.84	5.07
Results match pretrade estimates	▼ 1.39	2.45	1.67

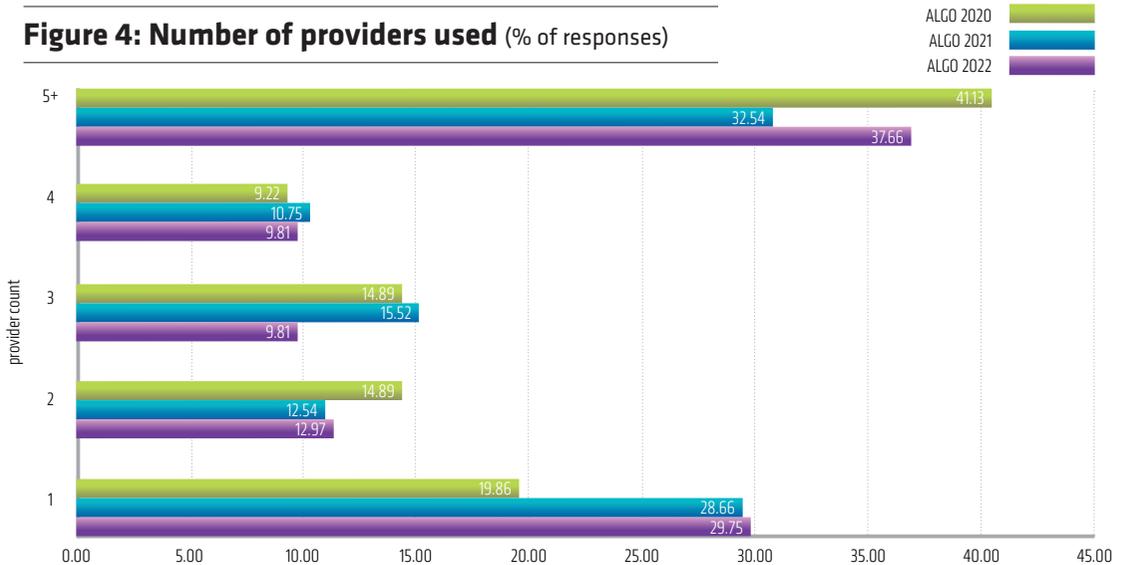
more algo providers. With the additional use of algorithms for different asset classes, one might assume step increases in the number of providers used by respondents, but that's not showing up in the data (Figure 3). Between 2021 and 2022, firms with more than \$50billion report using 4.4 providers, which was an increase of .54 more algo providers over 2021, but that largely brings them back in line with the 4.5 average they reported in 2019. Firms with \$10-\$50billion reported 4.53, which was an increase of 1.06

providers between 2021 and 2022, but this largely puts them in line with the 4.25 reported in 2020. The other asset bands have fluctuated year to year but have remained remarkably stable when viewed as a long-term trend line.

It is tempting to think next year will be different. While it's not surprising that almost 100% of respondents trade equities, the use of algorithms for other asset classes has the potential to grow in the coming year in response to these trends. Whether that will lead to firms looking for asset class-specific providers remains

Figure 3: Average number of providers used by AUM (USD billions)

AUM (billions USD)	2022	2021	2020	2019
Up to 0.25	▲ 3.00	2.13	2.14	2.13
0.25-0.5	▼ 2.22	2.50	1.83	2.2
0.5 to 1	▼ 1.83	2.64	2.00	1.43
1 to 10	▲ 3.32	2.94	3.33	2.9
10 to 50	▲ 4.53	3.47	4.25	3.73
More than 50	▲ 4.43	3.89	4.02	4.45
Not Answered	▲ 3.51	2.93	3.42	2.33

Figure 4: Number of providers used (% of responses)

to be seen. Just over half of long-only respondents reported they use algorithms to trade ETFs, 32% to trade listed derivatives such as futures and options, 26% to trade FX and 22% to trade fixed income. New regulations, including the potential extension of Reg ATS in the United States, could drive an expansion of liquidity sources around US government securities, among other asset classes. The FX market continues to grow and interest rate volatility is likely to continue to add fuel to that growth. The growth in new liquidity venues is also going to present a tremendous value proposition for firms looking to access those venues efficiently. The trend data, however, would suggest that firms will still look to the same average number of providers, but what we may see is managers holding the number of algo providers somewhat consistent while diversifying the types of algos used by asset class and strategy.

Putting aside the AUM segmentation of the number of providers chosen by long-only managers and looking only at the number of providers used by respondents shows a strong barbell distribution of results. A full 67% of respondents either use only one algorithmic provider or they use five or more, and that barbell has grown stronger over the past four years (Figure 4). In 2018 and 2019, the same barbell existed but captured roughly 58% of respondents. The explanation of this trend is multifaceted. Provider offerings have improved over the years, efforts to consolidate relationships have occurred on both buy- and sell-side, driving firms to fewer preferred trading relationships. At the same time a desire to diversify vendor exposure, support for traders' preferences and a desire for specialty tools and capabilities drive firms to more relationships.

The distribution of algo usage by value traded shows significant

variability year-over-year and across categories. If we remove the granular nuances and look at the percentage of firms that trade more than 50% of their volume via algorithms, it creates a more normalised lens through which we look at time series data. In 2022 results, the percentage of respondents trading more than 50% of this value traded via algorithms hit 57%. (Figure 5). That represented a steep jump from prior years. Between 2019 and 2021, the percentage of firms trading more than 50% of their volume via algorithms hovered between 49.2% and 50.9%. In isolation it might look like an annual anomaly, but in conjunction with the priorities that users of algorithms highlighted and the types of algorithms firms are using, it can be concluded that firms are actively looking to ensure participation across liquidity sources.

Long-only managers were asked to select the types of algorithms

they used from providers (Figure 6). In 2022 we see participants increasing the use of every type of algorithm. Those algorithms that ensure participation were the most frequently used, with % volume, dark liquidity seeking and VWAP all used by roughly three out of four survey participants. Those three algorithms also saw the biggest year-over-year increase in use. Percentage volume (participation) increased 16.5%, Dark liquidity seeking increased 15.9% and VWAP increased a staggering 21.2%. What makes these steep changes even more pronounced is that the percentage of respondents using different kinds of algorithms hasn't changed significantly over the past four years. Between 2019 and 2021, the use of % volume (participation) declined by 4%, the use of VWAP declined by 4.4% and the use of TWAP showed a surprising increase of 4.2%. There are a number of explanations for the increased use of participation algorithms and the broad adoption of all kinds of algorithms. The three most frequently discussed are as follows: First, as we hit our second year of travel bans, relationships continue to erode,

Figure 5. Algorithm usage by value traded (% of responses)

Value traded	2022	2021	2020	2019
unanswered	▲ 4.11	3.46	1.96	5.09
0-5%	▲ 6.96	5.19	4.71	6.08
5-10%	▼ 6.65	6.82	8.43	4.76
10-20%	▲ 6.65	4.55	6.08	11.17
20-30%	▼ 8.23	12.19	7.65	5.25
30-40%	▼ 5.70	6.64	9.22	9.69
40-50%	▼ 4.75	11.74	12.75	7.06
50% and over	▲ 56.96	49.41	49.22	50.90

Figure 6. Types of algorithms used (% of responses)

Strategy	2022	2021	2020	2019
% Volume (Participation)	▲ 73.42	56.96	49.02	60.92
Dark Liquidity Seeking	▲ 75.63	59.78	72.94	59.11
Implementation Shortfall (Basket)	▲ 23.42	15.56	13.92	16.42
Implementation Shortfall (Single Stock)	▲ 49.68	46.22	53.14	45.32
TWAP	▲ 38.29	25.75	24.71	21.51
VWAP	▲ 80.70	59.51	54.71	63.87
Target Close/Auction Algos	53.80			
Other	▼ 4.43	4.91	5.10	3.45

and that will lead traders to adopt more automated ways of executing transactions. Second, the increase in retail trade flow makes algorithms a fit-for-purpose tool

relative to this type of trading activity. Third, the tools and education offered by providers continues to improve and drives adoption.

Methodology

Buy-side survey respondents were asked to give a rating for each algorithm provider on a numerical scale from 1.0 (very weak) through to 7.0 (excellent), covering 15 functional criteria. In general, 5.0 (good) is the 'default' score of respondents. In total, a record number of 1,599 ratings were received across over 36 algo providers, yielding thousands of data points for analysis. Only the evaluations from clients who indicated that they were engaged in managing long-only strategies have been used to compile the provider profiles and overall market review information. Each evaluation was weighted according to three characteristics of each respondent: the value of

assets under management; the proportion of business done using algorithms; and the number of different providers being used. In this way the evaluations of the largest and broadest users of algorithms were weighted at up to three times the weight of the smallest and least experienced respondent. Finally, it should be noted that responses provided by affiliated entities are ignored. A few other responses where the respondent could not be properly verified were also excluded. We hope that readers find this approach both informative and useful as they assess different capabilities in the future. This year's analysis for the Algorithmic Trading Survey has been carried out by Aite-Novarica Group.

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Barclays

“Barclays BARX is one of Europe’s fastest growing electronic trading platforms, enjoying continued, year-on-year, market share gains,” states the British bank in its provider submission to the survey. The platform supports a full suite of core algorithms, including Implementation Shortfall (IS), Market-on-Close (MOC), Percentage of Volume (POV), Target Close and Volume-Weighted Average Price (VWAP). BARX cross-asset electronic trading platform covers a range of instruments such as equities, ETFs, fixed income, FX and listed derivatives.

Barclays’ overall average to the survey was 5.83. This represented a slight drop from 2021 (-0.07) and results that were slightly below the survey average of 5.88 (-0.05). The bank outperformed the category benchmarks in three service areas under review, including order routing logic or analysis (+0.12), customer support and services (+0.09) and algo monitoring (+0.04). The most significant underperformance was in customisation, which scored 24 basis points short of the category average. In reality, Barclays’ performance was largely unchanged from last year, with slight improvements across seven categories and slight decreases in eight categories.

The biggest improvement was in the area of cost (+0.10) and the biggest decreases were in the areas of customisation (-0.26) and breadth of dark pools (-0.23).

To measure algo performance, clients of Barclays responding to this year’s survey used implementation shortfall TCA, liquidity capture and VWAP TCA. Barclays received 47 responses this year from long-only managers – up from 38 responses in 2021 - which in terms of number of submissions, ranks the bank 14th amongst its peers. Around 32% of clients surveyed execute over 80% of their trades by algorithms on a daily basis and approximately one fifth (19%) of clients, represented firms managing assets of over \$50 billion. According to the bank’s provider submission to the survey, the BARX electronic trading team continued to help clients drive better trading outcomes in 2021 by navigating the ever-changing UK/EU trading landscape and Barclays Market Structure Team aims to keep buy-side clients abreast of the key themes including UK/EU regulatory divergence, consolidated tape, market resilience and dark trading restrictions.

BARCLAYS RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
5.95 ▼	5.86 ▲	5.92 ▲	5.89 ▲	5.93 ▲	5.84 ▼	5.57 ▼	5.45 ▼
Ease of use	Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of SOR	Algo monitoring	Average score
6.01 ▼	5.79 ▲	6.13 ▼	5.68 ▲	5.86 ▼	5.81 ▼	5.72 ▲	5.83 ▼

KEY STATS

Overall Outperformer:

Category Outperformer: ★ X3

6.13
Highest score
(customer support)



5.45
Lowest score
(customisation)

0.10
Most improved
(cost)



-0.26
Least improved
(customisation)

Berenberg

Berenberg's BEAT (Berenberg Algorithmic Trading) offering supports a full range of core algorithms across the equity and ETF markets of Europe and North America. Berenberg received 71 responses from long-only managers in this year's survey, placing the bank fourth highest among over 36 providers surveyed, and in line with client submissions received for the privately-owned bank in 2021. Responding clients were based in Europe, the UK and the US at a breakdown of 59%, 31% and 10% respectively, with 30% managing more than US\$50 billion in assets.

After a strong showing last year, Berenberg has continued to improve year-over-year. The bank's overall average scored an impressive 6.17, an improvement over last year of 19 basis points and significantly above the survey average of 5.88 (+0.29). The firm outperformed the benchmark in all of the fifteen categories under review in this year's survey. The areas where it differentiates itself from the competition is in the categories of customisation features (+0.50), algo monitoring (+0.47) and order routing logic/analysis (+0.41). Berenberg's score for customer support scored 48 basis points above the category

average and was the highest of all the providers profiled. Year-over-year improvements were recorded in every category, with its largest increases in scores achieved in key aspects of service such as customisation (+0.53), routing logic (+0.26), pre-trade cost analysis (+0.24) and algo monitoring (+0.32).

The most commonly used algos were VWAP, POV and dark liquidity seeking, with roughly two-thirds of clients using either VWAP TCA or Implementation Shortfall TCA to analyse algo performance with a fairly even distribution between the two methods. Feedback from respondents was highly complimentary of the customer service and support. Berenberg gets high marks for working hard with its clients to understand sources of liquidity and the best ways of accessing it. Requested enhancements are largely in line with the broader feedback provided to other providers and centered around customisation, support choosing the right algorithms for the situations, trading at the close and in flight analytics. The bank states that its BEAT offering has "continued its momentum as one of the fastest growing electronic franchises in EMEA".

BERENBERG RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
6.31 ▲	6.02 ▲	6.18 ▲	6.00 ▲	6.20 ▲	6.10 ▲	5.96 ▲	6.20 ▲
Ease of use	Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of SOR	Algo monitoring	Average score
6.29 ▲	6.08 ▲	6.52 ▲	6.04 ▲	6.36 ▲	6.12 ▲	6.15 ▲	6.17 ▲

KEY STATS

Overall Outperformer: 🏆

Category Outperformer: ★ X15

6.52

Highest score
(customer support)



5.96

Lowest score
(price improvement)

0.53

Most improved
(customisation)



0.02

Least improved
(execution consistency)

Bernstein

Bernstein's algorithmic offering comprises of a full suite of trading strategies to support both equities and ETF trading, globally. The broker's focus over the past year has been to support improvements to its wheel strategies in order to bring additional intelligence and control to aligning algorithmic trading strategies to orders and a focus on algorithms to support open and close auctions across the globe. Bernstein currently supports around 1,100 buy-side clients that actively use its algos, 59 of which are long-only managers who responded to this year's survey.

In 2022, Bernstein's scored an overall average of 6.05, up five basis points from its 2021 score and lands 18 basis points above the survey average of 5.88. The broker outperformed the benchmarks in all areas under review and scored particularly well in high-ranking categories such as access to dark pools (+0.29) and ease of use (+0.22). Cost and anonymity also rated well compared with the survey benchmarks, recording scores of +26 and +25 basis points respectively. Year-over-year performance increased across ten functional service areas, including trader productivity (+0.20), cost (+0.24) and price im-

provement (+0.21). The firm's scores dipped most in the areas of routing logic (-0.15), smart order routing (-0.12) and algo monitoring (-0.14). Client feedback was largely positive and suggested improvements in the flexible management of dark pools, help validating optimisation of trading set-up and better monitoring capabilities.

Long-only managers responding to this year's survey were based in Europe (56%), North America (34%) and APAC (10%). The most commonly used performance measurement metrics were VWAP TCA and implementation shortfall TCA. In terms of the AUM profile of respondents, exactly one third of long-only clients managed more than \$50 billion. This year evaluating market close interaction has been a key focus for Bernstein. "In Europe this has included aggregating TAL offerings and making the close interaction dynamic based on auction level relative to a multitude of execution benchmarks. In North America new functionality in both open and close auctions leverage later cutoff times for order entry allowing smarter reaction to imbalance data improving performance and liquidity capture," states the brokerage firm in its provider submission to the survey.

BERNSTEIN RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
6.23 ▲	5.99 ▲	6.11 ▲	6.20 ▲	6.07 ▲	6.16 ▲	5.85 ▲	5.86 ▼
Ease of use	Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of SOR	Algo monitoring	Average score
6.28 ▲	5.77 ▼	6.19 ▼	5.85 ▲	6.35 ▲	6.04 ▼	5.87 ▼	6.05 ▲

KEY STATS

Overall Outperformer: 🏆

Category Outperformer: ★ X15

6.35
Highest score
(dark pool access)



5.77
Lowest score
(order routing logic/analysis)

0.24
Most improved
(cost)



-0.15
Least improved
(order routing logic/analysis)

BNP Paribas Exane

BNP Paribas Exane offers a comprehensive suite of algorithms, now covering ETFs and equity markets across Europe, North America and APAC. Exane was operating in partnership with BNP Paribas until mid-2021 when the firm acquired the remaining 50% of the business. In the same year, the French investment bank completed the integration of Deutsche Bank's prime brokerage and electronic execution business, announcing the transfer of clients, technology and key staff from DB's Global Prime Finance and Electronic Equities businesses to BNP Paribas had been successfully completed by the end of 2021.

Once again we see a strong showing from BNP Paribas Exane, having received the highest number of responses at 92 from long-only managers and achieving a highly impressive average score of 6.42. This was an improvement (+0.21) over their 2021 ratings and significantly higher than the 5.88 survey average. For the second year in a row, scores represented the highest ratings of any of the providers profiled in the survey. Exane ranked first in every category except customer support and breadth

of dark pool access, where they ranked second. Stellar scores were achieved in key areas such as order routing, customisation, algo monitoring and execution consistency, where results landed 74, 71, 61 and 60 basis points above the category averages respectively.

Year-over-year scores for Exane have also shown higher ratings in every category, with the largest increases coming in the areas of routing logic (+0.39), pre-trade cost analysis (+0.31) and breadth of dark pools (+0.39). Thirty percent of managers doing business with Exane indicate they have \$50 billion or more in AUM and 71% trade 50% or more of their volume using algorithms. The most frequently used performance measurement metric by a large margin is VWAP TCA followed by implementation shortfall TCA. Respondent feedback and requests for additional functionality was in line with broader requests from traders for an ability to further customise algos with different participation rates for algos and better support for market open and close. One large European client praised the firm for "excellent service and constant innovation".

BNP PARIBAS EXANE RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
6.60 ▲	6.45 ▲	6.55 ▲	6.28 ▲	6.46 ▲	6.46 ▲	6.29 ▲	6.41 ▲
Ease of use	Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of SOR	Algo monitoring	Average score
6.52 ▲	6.41 ▲	6.47 ▲	6.30 ▲	6.45 ▲	6.41 ▲	6.30 ▲	6.42 ▲

KEY STATS

Overall Outperformer: 🏆

Category Outperformer: ★ X15

6.60
Highest score
(increase trader productivity)



6.28
Lowest score
(cost)

0.39
Most improved
(dark pool access)



0.01
Least improved
(customer support)

BofA Securities

BofA Securities (formerly Bank of America Merrill Lynch) achieved a marginal increase in this year's survey, with long-only respondents' ratings for the investment bank averaging an overall score of 5.70, up from its score of 5.67 in last year's survey, yet still 18 basis points below the survey average of 5.88. Disappointingly, the bank scored below the survey benchmarks in 14 of the 15 categories under review, the one exception being execution consulting and pre-trade cost estimation. Areas such as price improvement, customisation and increase trader productivity underperformed the most significantly, scoring -0.36, -0.35 and -0.32 points below the category averages respectively. Moreover, price improvement and increase trader productivity, as well as ease of use scored lowest amongst the providers profiled in this year's survey.

There is however, good news for BofA, as it showed marked improvements year-over-year in nine categories, including key services areas such as breadth of dark or alternative liquidity sources that are accessed (+0.35) and execution consulting and pre-trade costs estimation

(+0.23). By comparative standards, the area they lost the most ground is in the category of data on venue/order routing logic or analysis (-0.39) and price improvement (-0.27). BofA's long-only respondents were weighted towards the larger AUM brackets, with 72% reporting assets of more than \$10 billion. For the most part, traders responding to BofA were located in the US, UK and French markets.

The bank received 58 responses from long-only clients in this year's survey (up from 53 in 2021), which in terms of number of submissions, ranks the bank tenth amongst its peers. The most commonly used performance measurement metric by long-only respondents were implementation shortfall TCA (41%) and VWAP TCA (29%). Feedback from respondents is largely based around a desire for more customisation and configuration tools including stronger support for default logic. There was also a theme around a desire for better alerts and insights particularly as it relates to dark pools. A number of clients made comments around BofA's "great team and excellent customer coverage".

BOFA SECURITIES RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
5.75 ▲	5.71 ▲	5.80 ▲	5.88 ▲	5.85 ▲	5.74 ▼	5.37 ▼	5.35 ▼
Ease of use	Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of SOR	Algo monitoring	Average score
5.80 ▲	5.43 ▼	5.81 ▼	5.69 ▲	6.00 ▲	5.63 ▼	5.62 ▲	5.70 ▲

KEY STATS

Overall Outperformer:

Category Outperformer: ★ X1

6.00
Highest score
(dark pool access)



5.35
Lowest score
(customisation)

0.35
Most improved
(dark pool access)



-0.39
Least improved
(order routing logic/analysis)

Goldman Sachs

Goldman Sachs Electronic Trading (GSET) offers a full suite of algorithms, including liquidity-seeking, benchmark-matching, and dynamic volume participation, as well as a smart order router. GSET also integrates its algorithms with its liquidity pools, SIGMA X. Responding clients were based mainly in Europe (58%) and the UK (30%), with only 9% based in North America. The New York-headquartered investment bank attracted the second highest number of long-only fund responses (79) in this year's survey.

Goldman Sachs' overall average of 5.69 is largely in line with their 2021 score of 5.72 (-0.03), yet falls 19 basis points below the survey average of 5.88. The largest year-over-year improvements were seen in speed (+0.11), customisation (+0.12) and execution consulting and pre-trade cost estimates (+0.11). The largest drops in ratings were observed in order routing logic (-0.21), breadth of dark pools (-0.18) and algo monitoring (-0.23). Compared to this year's survey benchmarks, Goldman Sachs underperformed in all 15 service areas under review,

scoring lowest of all providers profiled in the survey in categories such as reduced market impact (-0.22), cost (-0.14), anonymity (-0.36) and access to dark pools (-0.32). All scores however achieve ratings firmly in the mid-to-high Good range (5.00-5.99), usually recognised as the default score of respondents.

Clients managing over \$50 billion in assets represent 35% of respondents doing business with Goldman Sachs in the long-only 2022 survey. 66% of firms looking to the company for trading expertise indicate they trade at least half of their portfolio volume algorithmically. The most commonly used performance measurement metrics were VWAP TCA (33%), implementation shortfall TCA (32%) and liquidity capture (14%). Feedback from respondents about requested features varied but largely centered on a consistent theme of more granular control and customisation of algorithms with additional requests that varied from the ability to queue overnight orders to better in-flight analytics.

GOLDMAN SACHS RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
5.90	5.67 ▲	5.89 ▼	5.81 ▲	5.89 ▲	5.54 ▼	5.56 ▲	5.62 ▲
Ease of use	Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of SOR	Algo monitoring	Average score
5.83 ▼	5.43 ▼	5.67 ▼	5.64 ▲	5.74 ▼	5.75 ▼	5.42 ▼	5.69 ▼

KEY STATS

Overall Outperformer:

Category Outperformer:

5.90

Highest score
(increase trader productivity)



5.42

Lowest score
(algo monitoring)

0.12

Most improved
(customisation)



-0.23

Least improved
(algo monitoring)

Instinet

Instinet is a New York-headquartered institutional, agency-model broker that also serves as the independent equity trading arm of its parent, Nomura Group. Instinet offers a full complement of algorithms that support equities, ETFs and listed derivatives, globally. Long-only respondents using Instinet most frequently reported using implementation shortfall TCA and VWAP TCA to measure algo performance. Around 67% of managers who selected Instinet as a provider, execute at least half of their portfolio value algorithmically. Thirty-five percent manage upwards of \$50 billion in assets.

In 2021, Instinet continued to look at improving the capabilities of its offerings. Three are worthy of note. First, Instinet has integrated its electronic conditional orders into its algorithms. Second, it has more formally integrated new Machine Learning techniques to support adaptive algorithm management through its Micro Adaptive Sequencer (MAS) to provide more responsive adaptation to market conditions. Finally, the broker launched Algo-to-Algo Crossing through Instinet CBX effectively

creating an algo-to-algo crossing network.

Instinet garnered 55 responses this year from long-only managers – up from 51 in 2021 – which in terms of number of submissions, ranks the bank 11th amongst its peers. Instinet’s overall average of 5.86 is largely unchanged from last year’s 5.89 (-0.03) and in line with the survey average of 5.88. The firm outperformed the survey benchmarks in seven categories, the most significant being dark pool access (+0.18). Instinet saw improvements in a number of areas over 2021. The two most significant areas of improvement would be trader productivity (+0.20) and cost (+0.22). The three most notable areas where the firm saw scores decline were in the categories of customisation (-0.25), routing logic (-0.32) and customer support (-0.26). In terms of additional features that respondents would like to see, there was a high degree of consistency with other providers. They’re looking for better monitoring tools, more customisation, and more granular flexibility to manage the algos both in the ticket as well as between types of liquidity venues.

INSTINET RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
6.16 ▲	5.99 ▲	5.99 ▼	6.03 ▲	5.89	6.06 ▼	5.73 ▲	5.40 ▼
Ease of use	Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of SOR	Algo monitoring	Average score
6.14 ▲	5.32 ▼	5.89 ▼	5.61 ▼	6.24 ▲	5.82 ▲	5.68 ▼	5.86 ▼

KEY STATS

Overall Outperformer:

Category Outperformer: ★ X7

6.24
Highest score
(dark pool access)



5.32
Lowest score
(order routing logic/analysis)

0.22
Most improved
(cost)



-0.32
Least improved
(order routing logic/analysis)

Jefferies

Jefferies International offers a full suite of algorithms to around 150 buy-side clients, trading equity markets across all regions. Jefferies received 61 responses this year from long-only managers, ranking the independent investment bank eighth amongst the providers profiled in this year's survey. Responding clients were based mainly in Europe (43%), the UK (30%) and the US (23%), with 39% of respondents coming from long-only firms with more than \$50 billion AUM.

Jefferies came with a strong overall average survey response of 6.11. This was a significant improvement over its 5.85 score in 2021 and ranks its performance among the top three overall scores of all providers profiled. Jefferies outperformed the benchmarks in all service areas and finished in the top three scores in nine out of the 15 survey categories under review. The most notable areas where Jefferies differentiate themselves relative to the category average are across key aspects of service, including increase trader productivity (+0.31), reduce market

impact (+0.30), speed (+0.30), customisation (+.30) and customer support (+0.38). The only area where Jefferies was not at least ten basis points over the category average was breadth of dark pools (+0.06).

Year-over-year comparisons were also very positive, with large improvements in scores observed in reduce market impact, speed, increase trader productivity and price improvement, recording increases of 46, 43, 37 and 33 basis points respectively.

The most commonly used algos were VWAP, dark liquidity seeking, POV and implementation shortfall (single stock). To measure algo performance, over half of clients of Jefferies responding to this year's survey used implementation shortfall TCA and around one quarter used VWAP TCA. The firm received some strong praise in terms of personnel. Other feedback from respondents focuses on more customisation capabilities and better tools to access and control dark pools.

JEFFERIES RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
6.37 ▲	6.19 ▲	6.20 ▲	6.05 ▲	6.29 ▲	6.16 ▲	5.96 ▲	6.00 ▲
Ease of use	Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of SOR	Algo monitoring	Average score
6.33 ▲	5.81	6.42 ▲	5.88 ▲	6.13 ▲	6.04 ▲	5.91 ▲	6.11 ▲

KEY STATS

Overall Outperformer: 🏆

Category Outperformer: ★ X15

6.42

Highest score
(customer support)



5.81

Lowest score
(order routing logic/analysis)

0.46

Most improved
(reduced market impact)



0.00

Least improved
(order routing logic/analysis)

JP Morgan

JP Morgan received 69 responses from long-only managers in this year's survey - up from 60 in 2021 - which in terms of number of submissions, places the New York-headquartered investment bank fifth place among over 36 providers surveyed. Long-only respondents to this year's survey reported implementation shortfall TCA as the most frequently used algo performance measurement, followed by VWAP TCA. Forty-three percent of the participant funds using JP Morgan's algos manage over \$50 billion in assets, which is down from 46% compared to last year's long-only submissions for the bank.

JP Morgan's average score of 5.85 marks a 23 basis point improvement from its average score in last year's survey (5.62) and puts it largely in line with the 2022 survey average of 5.88. Respondents reported higher scores in all but the categories of anonymity, order routing logic and execution consulting and pre-trade cost analysis, which were largely flat year-over-year. The largest improve-

ments were seen in the areas of reduced market impact (+0.47), execution consistency (+0.48), cost (+0.48) and breadth of dark pools (+0.30). Despite improvements, JP Morgan fell short of the survey benchmarks in nine aspects of service under review, most notably in the areas of anonymity and customer support, where the bank underperformed the category average by 19 and 15 basis points respectively. Meanwhile, on the plus side, the category of cost recorded the bank's highest outperformance, achieving a score of 12 basis points above the category average.

Almost three quarters of funds responding to JP Morgan were based in Europe and 19% based were based in the US. Feedback on requested additional enhancements was largely consistent with other providers. There were a number of respondents looking for better control over liquidity venues, better monitoring tools and ongoing enhancements to market close and TAL solutions.

JP MORGAN RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
6.05 ▲	5.92 ▲	6.03 ▲	6.06 ▲	6.05 ▲	5.72 ▼	5.71 ▲	5.58 ▲
Ease of use	Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of SOR	Algo monitoring	Average score
6.09 ▲	5.57 ▼	5.89 ▲	5.60 ▼	6.05 ▲	5.84 ▲	5.66 ▲	5.85 ▲

KEY STATS

Overall Outperformer:

Category Outperformer: ★ X5

6.09
Highest score
(ease of use)



5.57
Lowest score
(order routing logic/analysis)

0.48
Most improved
(execution consistency)



-0.09
Least improved
(anonymity)

Kepler Cheuvreux

Kepler Cheuvreux offers a comprehensive suite of algorithms, to around 350 buy-side clients, across ETFs and equity markets in Europe, North America and LATAM. In 2021, Kepler Cheuvreux made a number of enhancements to its Quantitative Algorithmic Infrastructure (QAI) including Quantitative Dark Scheduling (QDS) and Quantitative Target Close (QTC) strategy, as it works to address the ongoing client demands for better dark pool and algos that optimise performance for market close. Kepler received 75 responses from long-only managers in this year's survey, ranking the European financial services company third highest in terms of number of responses, among over 36 providers rated in 2022. Of those, 17% represented firms with more than \$50 billion in AUM. This is a lower percent than many of the other providers profiled in this year's report.

In this year's survey, Kepler recorded an overall average score of 5.93, five basis points higher than the survey average of 5.88 and a slight drop from its 2021 rating

(-0.04). Kepler stands out above the survey average in 10 key functional areas, including customisation (+0.28), customer support (+0.15) and algo monitoring (+0.16). Not surprisingly the category that showed the most year-over-year improvement for Kepler was customisation features (+0.28), followed by access to dark pools (+0.16). Kepler slipped from last year's ratings in a number of categories, most notably in price improvement (-0.27) and reduced market impact (-0.24).

In its provider submission to the survey, Kepler state that it "saw another record year for volumes and revenues in 2021 while gaining significant market share." The firm received a notable number of unsolicited praise for its customer service. One UK manager summed it up succinctly "Stand out engagement with us - take lots of time to work together to understand and improve algo performance. Real expertise consulting our execution." Other client feedback includes requests for more customisation capabilities and stronger TCA consulting.

KEPLER CHEUVREUX RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
6.17 ▲	5.85 ▼	5.96 ▼	5.99 ▼	5.82 ▼	5.97 ▼	5.61 ▼	5.98 ▲
Ease of use	Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of SOR	Algo monitoring	Average score
6.06 ▼	5.76 ▲	6.19 ▼	5.79 ▲	6.05 ▲	5.95 ▼	5.85 ▲	5.93 ▼

KEY STATS

Overall Outperformer: 🏆

Category Outperformer: ★ X10

6.19
Highest score
(customer support)



5.61
Lowest score
(price improvement)

0.28
Most improved
(customisation)



-0.27
Least improved
(price improvement)

Morgan Stanley

Morgan Stanley Electronic Trading (MSET) offers global electronic access across cash equities, options, and futures. The firm's electronic trading tools include a broad suite of algorithms, smart order routing, and DMA. By way of measuring algo performance, respondents primarily use implementation shortfall TCA and VWAP TCA. Forty percent of long-only clients manage assets greater than \$50 billion, up from 38% of responding clients in last year's survey.

Morgan Stanley received 63 responses from long-only funds – up from 60 in 2021 – placing the New York-headquartered investment bank seventh amongst over 36 providers rated in this year's survey. The bank achieved an overall average score of 5.64 this year, marginally down from its score of 5.67 in 2021 and 24 basis points below the survey average of 5.88. Disappointingly, Morgan Stanley fell short of the survey benchmarks in all categories under review. Significant underperformance was recorded by clients in the areas of customisation

(-0.46), customer support (-0.42) and order routing logic or analysis (-0.41). That said, some good improvements were achieved year-over year, most notably in the areas of price improvement (+0.21), cost (+0.18) and speed (+0.13), the latter of which represented the bank's highest performing category (5.94). Scores did, however, slip in a number of areas, including order routing logic (-0.31), execution consulting and pre-trade cost analysis (-0.27) and algo monitoring (-0.29).

Responding long-only managers were based in Europe, the UK and the US at a breakdown of 59%, 24% and 13% respectively. Clients use a range of strategies, most commonly benchmark algos such as VWAP and POV, plus price improvement strategies such as dark liquidity seeking. Feedback on requested additional enhancements was largely consistent with other providers. In terms of additional comments, one UK-based head of equity trading at a large asset manager simply stated "best on street".

MORGAN STANLEY RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
5.88 ▲	5.68 ▼	5.77 ▼	5.86 ▲	5.94 ▲	5.66 ▲	5.63 ▲	5.23 ▼
Ease of use	Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of SOR	Algo monitoring	Average score
5.93 ▲	5.25 ▼	5.62 ▼	5.31 ▼	5.84 ▲	5.67 ▲	5.38 ▼	5.64 ▼

KEY STATS

Overall Outperformer:

Category Outperformer:

5.94
Highest score
(speed)



5.23
Lowest score
(customisation)

0.21
Most improved
(price improvement)



-0.31
Least improved
(order routing logic/analysis)

RBC Capital Markets

RBC Capital Markets offers a full suite of algorithms across Europe and North America. Asset classes covered by the global investment bank include bonds, equities, ETFs, FX and listed derivatives. RBC CM received responses from 54 long-only managers this year – up from 27 in 2021 - with over one third (35%) of clients coming from firms with more than \$50 billion in AUM. By way of measuring algo performance, respondents primarily use implementation shortfall TCA and VWAP TCA.

RBC achieved an overall average of 5.94 in this year's survey, which represents a 13 basis point improvement over its 2021 average of 5.81 and topped the 2022 survey average of 5.88. The bank outperformed the survey benchmarks across ten service areas and recorded top three finishes in the key categories of cost (+0.13) and customisation features (+0.35). Other notable areas include ease of use, which landed 23 basis points above the category average. The only category where RBC lags the survey average by more than ten basis points is in the area of execution consulting and pre-trade cost

analysis (-0.17). Year-over-year scores were up across 12 categories, with significant improvements recorded in customisation (+0.63) and ease of use (+0.42). Marginal decreases were observed in three areas, the largest of which was anonymity (-0.09).

Long-only managers responding to RBC were based in Europe, the UK and North America at a breakdown of 50%, 31% and 19% respectively. Clients recorded that an average of 56% of trades by value, are executed by algorithms on a daily basis. "While RBC operates a multi-asset class algo offering, the respondents who voted for RBC in the 2022 survey are clients of our equity algo offering" stated the bank in their provider submission to the survey. Feedback from respondents using RBC algos requested ongoing enhancements to the solution. Additional solutions for different asset classes, more flexible ways of interacting with liquidity sources, more control and customisation and better analytics to measure performance. In addition, the bank received some strong praise for key personnel.

RBC CAPITAL MARKETS RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
6.02 ▲	5.90 ▲	6.03 ▲	6.07 ▲	6.12 ▲	5.82 ▼	5.82 ▲	6.04 ▲
Ease of use	Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of SOR	Algo monitoring	Average score
6.29 ▲	5.73 ▼	6.01 ▼	5.51 ▲	6.05 ▲	5.91 ▲	5.77 ▲	5.94 ▲

KEY STATS

Overall Outperformer: 🏆

Category Outperformer: ★ X10

6.29
Highest score
(ease of use)



5.51
Lowest score
(execution consulting)

0.63
Most improved
(customisation)



-0.09
Least improved
(anonymity)

Redburn

Redburn's Execution Services delivers high-touch sales trading and execution and low-touch execution and algorithmic solutions, covering equities markets in Europe and North America. The independent equities broker also offers market structure and trading analytics. Redburn has noted the movement by the buy-side towards more customised and automated solutions and has been working to respond with platform enhancements to deliver on the demand for more custom solutions.

Redburn received 51 submissions from long-only managers this year, which represented a significant jump from 2021 where it received 33 respondents. Exactly one third (33%) of clients were firms with more than \$50 billion in AUM. Redburn's investment in its implementation shortfall strategies shows how its clients measure the performance of their algorithms. Eighty percent of respondents use either VWAP or implementation shortfall to measure performance but where other providers' respondents use them in equal proportions, 60% of Redburn clients use implementation shortfall TCA to 20% who use VWAP TCA.

Redburn's average score of 6.06 represents a slight improvement over last year's average of 5.98 and lands well

above this year's survey average of 5.88. Redburn outperformed the survey benchmarks in 14 aspects of service. The broker scored particularly well in several categories, with a number one finish in the area of breadth of dark pools and top three finishes in the categories of routing logic, customer support and smart order routing. Year-on-year increases were achieved in 11 categories. In last year's survey it was noted that execution consulting was an area where the firm had room for improvement. In 2022, this was the most improved category for Redburn (+0.30). Other notable improvements were made in the areas of speed (+0.23), and breadth of dark pools (+0.24). Redburn did have some year-over-year slippage, most notably in the category of algo monitoring (-0.18).

Respondents talked about strong execution performance and the clarity of the solution offerings. One UK based fund manager said "benchmarks at the very top vs our other algo providers. Excellent price, breadth (sic) of liquidity and service". Requested enhancements were in line with the other providers and focused on more flexible order management with respect to GTC orders, enhanced support for market close and more flexible management of dark pools.

REDBURN RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
6.23 ▲	5.91 ▼	6.17 ▲	5.94 ▲	6.08 ▲	6.02 ▲	5.91 ▼	5.88 ▲
Ease of use	Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of SOR	Algo monitoring	Average score
6.20 ▲	5.94 ▼	6.46 ▲	5.79 ▲	6.46 ▲	6.08 ▲	5.87 ▼	6.06 ▲

KEY STATS

Overall Outperformer: 🏆

Category Outperformer: ★ X14

6.46
Highest score
(customer support)



5.79
Lowest score
(execution consulting)

0.30
Most improved
(execution consulting)



-0.18
Least improved
(algo monitoring)

UBS

UBS has been investing in its Electronic Trading offering, building on their equities and eFX technology. Headquartered in Zurich, the privately owned investment bank provides access to liquidity, algorithms, execution consultancy, performance analysis and market structure expertise. UBS received 64 responses to its algorithmic trading solutions in this year's survey, down from 69 in 2021. Exactly half of UBS' long-only clients participating in the survey this year manage \$50 billion or more in AUM.

UBS received an overall average of 5.68, recording a significant improvement of 27 basis points over last year's average score of 5.40. Despite improvements, the bank underperformed the survey benchmarks across all categories this year and recorded the lowest score of all providers profiled in three areas, namely execution consistency (-0.26), speed (-0.18) and flexibility and sophistication of smart order routing (-0.37). Increase trader productivity and dark pool access also received low rankings, scoring -30 and -26 basis points below cat-

egory average. One dissatisfied US based asset manager complained of "almost no contact [or] support from our coverage". Yet despite receiving relatively low scores, UBS recorded year-on-year improvements in all 15 categories under review. The biggest improvements were seen in the areas of reduced market impact (+0.31), cost (+0.34), anonymity (+0.40), customisation features (+0.38), customer support (+0.52), pre-trade cost (+.36) and flexibility and sophistication of Smart Order Router (+.37).

In terms of regional breakdown, half of long-only managers responding to UBS were based in Europe, 25% in the UK, 20% in North America and 6% were located in APAC. Clients using algorithms execute an average of 61% of trades by volume on a daily basis. The most commonly used performance measurement metrics were and VWAP TCA, implementation shortfall TCA and liquidity capture. Additional features requested by respondents was in line with broader feedback. More flexible customisations, more visibility into algo logic and execution venue and improved in-flight algo performance.

UBS RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
5.76 ▲	5.77 ▲	5.69 ▲	5.85 ▲	5.81 ▲	5.80 ▲	5.59 ▲	5.49 ▲
Ease of use	Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of SOR	Algo monitoring	Average score
5.90 ▲	5.43 ▲	5.87 ▲	5.46 ▲	5.80 ▲	5.47 ▲	5.52 ▲	5.68 ▲

KEY STATS

Overall Outperformer:

Category Outperformer:

5.90
Highest score
(ease of use)



5.43
Lowest score
(order routing logic/analysis)

0.52
Most improved
(customer support)



0.07
Least improved
(price improvement)

Virtu Financial

Virtu Financials’ algorithmic trading service, known as Virtu Frontier, supports over 500 clients on the buy-side. Following the acquisition of ITG back in 2019, the firm now offers a full complement of algorithms that support equities and ETFs markets across all regions. The financial services firm states that its execution strategies are designed with simple principles in mind: trader intuition and transparency. Virtu received 47 responses from long-only managers in this year’s survey, down from 49 in 2021. Of these, roughly one third (36%) were respondents managing more than \$50 billion in assets, this compares to 49% of clients from the larger AUM bracket in 2021.

With an average score of 5.73, Virtu slipped from its 2021 overall average of 5.89 (-0.16) and fell below this year’s survey average of 5.88 by a total of 15 basis points. Year-over-year scores dropped in twelve of the fifteen categories under review, most notably in customer support and services (-0.46) and order routing logic/analysis (-0.40). The key category of cost recorded the highest improvement, landing 20 basis points ahead of its

2021 score. Compared to the 2022 benchmarks, Virtu is largely in line with other providers across the 15 survey categories with a couple of notable exceptions. The firm outperformed the category average by 28 basis points in the area of breadth of dark pools, but fell below in the critical areas of customisation (-0.59) and customer support (-0.47). Overall, Virtu beat the category average in five of the categories surveyed.

Long-only managers responding to this year’s survey were based in Europe (55%), North America (26%) and the UK (17%). Clients recorded that an average of 57% of trades by value are executed by algorithms on a daily basis. The most commonly used performance measurement metrics were implementation shortfall TCA, followed by VWAP TCA and liquidity capture. Feedback from respondents using Virtu’s algos requested more customisation capabilities, plus more flow and liquidity colour – “what’s trading where and how our orders are being executed...”. asks a European-based head of equities. In regards to algo monitoring, one UK-based head of trading commented “Automated IB Alerts not available”.

VIRTU FINANCIAL RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
6.07 ▲	5.68 ▼	5.71 ▼	5.99 ▲	5.91 ▼	5.96 ▼	5.64 ▼	5.11 ▼
Ease of use	Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of SOR	Algo monitoring	Average score
5.92 ▼	5.47 ▼	5.57 ▼	5.34 ▼	6.34 ▲	5.91 ▼	5.28 ▼	5.73 ▼

KEY STATS

Overall Outperformer:

Category Outperformer: ★ X5

6.34
Highest score
(dark pool access)



5.11
Lowest score
(customisation)

0.20
Most improved
(cost)



-0.46
Least improved
(customer support)

CITI RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
5.53 ▼	5.45 ▲	5.43 ▼	5.65 ▲	5.62 ▲	5.46 ▲	5.19 ▼	5.31 ▲
Ease of use	Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of SOR	Algo monitoring	Average score
5.80 ▼	5.16 ▼	5.57 ▼	5.56 ▲	5.60 ▲	5.26 ▼	5.30 ▼	5.46 ▼

COWEN INC. RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
6.17 ▲	5.86 ▲	6.21 ▲	5.85 ▲	6.04 ▲	5.78 ▼	5.74 ▼	6.26 ▲
Ease of use	Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of SOR	Algo monitoring	Average score
6.02 ▼	6.12 ▼	6.19 ▼	5.70 ▼	6.23 ▲	5.99 ▲	5.88 ▲	6.00 ▲

CREDIT SUISSE RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
5.73 ▼	5.57 ▼	5.63 ▼	6.04 ▲	5.61 ▼	5.50 ▼	5.51 ▲	5.43 ▼
Ease of use	Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of SOR	Algo monitoring	Average score
5.92 ▲	5.41 ▼	5.56 ▲	5.36 ▼	5.57 ▼	5.64 ▲	5.38 ▲	5.59 ▼

LIQUIDNET RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
6.07 ▼	5.96 ▼	5.60 ▼	5.40 ▲	5.80 ▲	5.76 ▼	5.68 ▼	5.25 ▲
Ease of use	Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of SOR	Algo monitoring	Average score
6.04 ▲	5.39 ▼	6.13 ▼	5.20 ▼	6.14 ▼	5.46 ▼	5.36 ▼	5.68 ▼

STIFEL EUROPE* RATINGS FOR ALGORITHMIC PERFORMANCE

*2021 scores not comparable due to limited sample size

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
5.90	5.96	5.80	5.82	5.90	6.15	5.72	5.70
Ease of use	Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of SOR	Algo monitoring	Average score
6.06	6.15	6.41	5.91	6.38	5.80	5.77	5.96

SOCIETE GENERALE RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
5.94 ▼	5.60 ▼	5.93 ▼	5.89	6.06 ▲	5.84 ▼	5.70 ▼	5.84 ▼
Ease of use	Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of SOR	Algo monitoring	Average score
5.67 ▼	5.50 ▼	6.02 ▼	5.64 ▼	5.79 ▼	5.40 ▼	5.35 ▼	5.75 ▼