THE 2022 ALGORITHMIC TRADING SURVEY

HEDGE FUND

With special analysis from
Aite-Novarica Group

AiteNovarica

Hedge funds demand more customisation capabilities and deeper dark aggregation

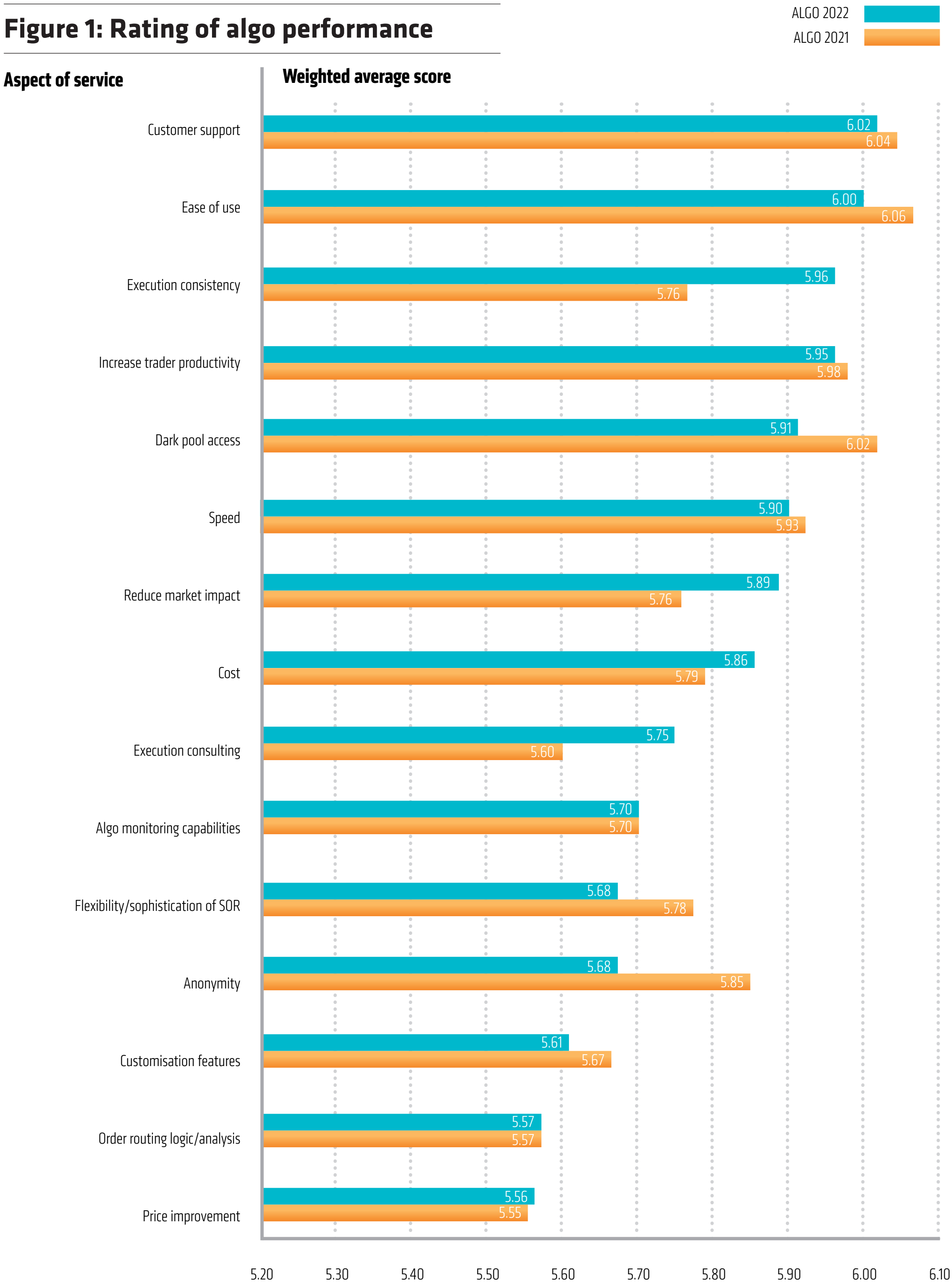
Results from The TRADE's 2022 Algorithmic Trading Survey reveal that while execution quality remains top of mind for hedge funds, additional features desired include further customisation capabilities, more control, deeper dark aggregation and increased reduction of market impact.

The hedge fund industry posted double digit returns for the second year in a row, but not everything was rosy. Performance lagged the S&P 500 significantly. According to the Barclays Hedge Fund Index, Hedge Funds returned 10.22% in 2021. That compares to an MSCI EAFE return of 8.78% and 26.89% return for the S&P 500. Last year's performance was truly non-linear, punctuated by disparate returns across strategies. 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 and with the Barclays Hedge Fund Index showing negative returns in three of the first four months of 2022, it is looking like another challenging year. All of which made the results of this year's Hedge Funds 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.

The average score of hedge fund respondents to The TRADE's Algorithmic Trading survey in 2022 declined slightly from 5.82 in 2021, down to 5.80. Nevertheless, this is still up from 2020's survey average of 5.77. Respondents were based mainly in Europe (41%), the UK (35%) and North America (17%) with handful located in APAC (5%) and ROW (2%). Overall, the majority of categories received lower ratings in this year's survey compared to 2021. The two categories with the largest reductions in 2022 were data on venue/order routing logic or analysis which decreased 19 basis points to 5.57 and anonymity, which decreased 18 basis points to 5.68. Price improvement, data on venue and customisation features make up the lowest scores, with 5.56, 5.57 and 5.61, respectively.

The survey reveals that the most impactful feature of algorithms rated by hedge funds in 2022 is customer support, followed by ease of use, execution consistency, increased trader productivity and dark pool access (Figure 1). Although customer support and ease of use remained the two highest rated features of algorithms in 2022, it is interesting to note that scores in both categories did decline

Figure 1: Rating of algo performance



for the first time in recent years. The largest improvements in ratings were in the categories of execution consistency (+.20), execution consulting (+.15) and reduce market impact (+.13). This resulted in execution consistency moving up to become the third highest rated category in 2022, an impressive feat for algo providers given the recent market environment.

While it is true to say there hasn't been progress in all aspects of algorithm performance, the range of average scores did tighten again in 2022, with a minimum score of 5.56 and a maximum of 6.02. Although there is still room for improvement, this indicates further convergence of provider services. The question is whether this will create commoditisation of capabilities. The good news is that this market continues to evolve, and traders continue to want more. While a continued focus on execution quality remains top of mind, additional features desired by hedge funds include further customisation capabilities, more control, deeper dark aggregation and increased reduction of market impact.

Respondents' reasons for using algorithms are presented in Figure 2 as a percentage of responses for the 2021-2022 survey results. Top reasons for using algorithms as stated by hedge fund clients are ease of use (12.06%), reduce market impact (11.58%), increase trader productivity (10.42%) and consistency of execution performance (10.24%). As a reason for using algorithms, consistency of execution performance notched the largest year-over-year increase, echoing the move by respondents to give execution consistency the largest score increase in this year's survey. Clearly providers are focused on delivering against the highest priorities of the market. Higher speed, lower latency also showed a large increase from last year, moving into the number five spot, a big jump from where it sat last year.

There were only four areas that saw decreases from last year's survey results – lower commission rates, greater anonymity, flexibility and sophistication of Smart Order Routing (SOR) and algo monitoring capabilities.

The percentage of hedge fund respondents indicating flexibility and sophistication of SOR as a reason for using algorithms showed the largest decrease this year, marking a reversal in recent trends. Survey participants had been indicating SOR as an increasing importance as a reason for using algorithms since 2019. Generally, the ranking of reasons for using algorithms is consistent across respondents, however the largest discrepancy among firm size is in regard to greater anonymity. Not surprising, respondents with more than $50

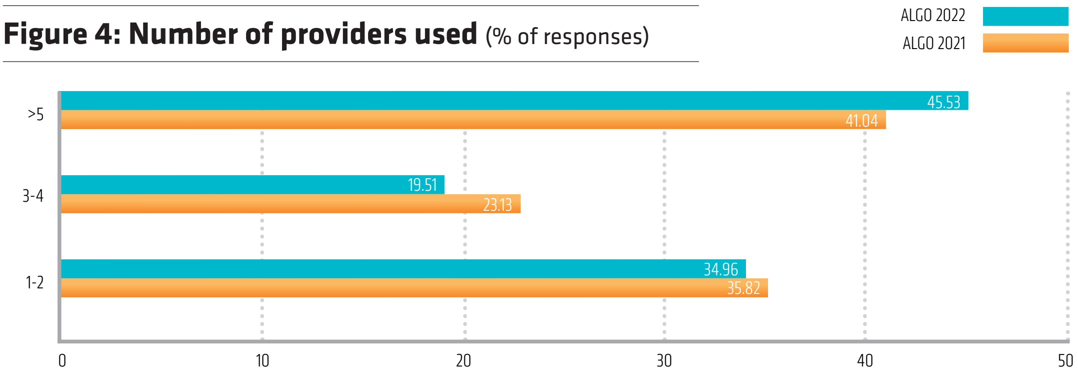
Figure 2: Reasons for using algorithms (% of responses)

Feature	2022	2021
Ease of use	▲ 12.06	11.21
Reduce market impact	▲ 11.58	10.78
Increased trader productivity	▲ 10.42	10.29
Consistency of execution performance	▲ 10.24	8.68
Higher speed, lower latency	▲ 8.17	7.02
Customisation capabilities	▲ 7.55	6.90
Better prices (price improvement)	▲ 7.50	7.18
Lower commission rates	▼ 7.36	9.27
Greater anonymity	▼ 6.99	8.28
Flexibility and sophistication of SOR	▼ 6.37	8.47
Algo monitoring capabilities	▼ 5.02	5.91
Data on venue/order routing logic or analysis	▲ 4.46	4.16
Results match pre-trade estimates	▲ 2.28	1.85

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

Feature	2022	2021
More than $50 billion	3.94	3.94
$10 - 50 billion	▲ 5.52	4.00
$1 - 10 billion	▲ 5.39	3.90
$0.5 - 1 billion	▲ 3.89	3.36
$.025- 0.5 billion	▲ 2.60	2.20
Up to $0.25 billion	▲ 3.33	1.80
Not answered	▲ 4.00	3.78

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



billion in AUM who typically have larger positions to move rated greater anonymity as their number four reason for using algorithms at 10.44%, compared to the broader average of 6.99%, making it the number nine reason overall.

The 2022 survey reveals that hedge funds of all sizes, except those with more than $50 billion under management, on average, have increased the number of algo providers they use (Figure 3). The largest hedge funds did not decrease the number of providers used but instead stayed the same as last year. Hedge funds with assets under management between $1 billion-$50 billion report using on average more than five algo providers, more than respondents at other firm sizes. The largest year-over-year increase in the average number of providers used, are with funds managing $10 to $50 billion, up to $.25 billion and $1 to $10 billion.

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, as a result of the market environment. Just over half of hedge funds surveyed reported they use algos to trade ETFs, 41% to trade listed derivatives such as futures and options, 31% to trade FX and 20% 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 adding fuel to that growth. The increase in new liquidity venues is also going to present a value proposition for firms looking to access those venues efficiently. Whether all of this will lead to hedge funds looking for asset class-specific algo providers and subsequently growing their average number of providers used or instead diversifying the types of algos used by asset class and strategy and holding the number of providers relatively constant remains to be seen.

Taking AUM out of the picture, Figure 4 shows a barbell distribution of results when looking at the number of providers hedge funds use. Just under 35% of respondents reported using one to two providers, down slightly from 35.8% in 2021, while the percentage of respondents using three to four providers decreased from 23% in 2021 to 19.5% in 2022. Additionally, the percentage of funds using five or more providers increased to 45.5% from 41% in 2021. The explanation to this distribution is perhaps multi-faceted. Providers have generally improved their offerings over the years and efforts to consolidate relationships have occurred on both sides. At the same time a desire to diversify vendor exposure and capabilities drive funds to engage in additional provider relationships.

The percentage of respondents that use algorithms for the majority of their total value traded increased from 53% in 2021 to almost 66% in 2022 (Figure 5). However, unlike last year's survey, that increase is derived from those trading 50-70% of their total value, rather than those using algorithms to trade more than 70%. Interestingly, despite the increase in hedge funds using algorithms to trade the majority of their total value, the largest year-over-year decrease came from those that trade 70-80% of their total value with algorithms. Regardless, it is clear that hedge funds will continue to use algorithms to trade the majority of their total portfolio value.

In 2022 we see hedge funds increasing their use of every type of algorithm. Dark liquidity seeking algorithms were the most frequently used, with participation algorithms VWAP and percentage of volume rounding out the top 3. Those three types also saw the largest year-over-year increases in use. VWAP increased a staggering 21%, POV increased 12.7% and dark liquidity seeking increased 12.2%. There are a number of explanations for the increased use of participation algos and the broad adoption of all algos. The three most frequently discussed are: first, as travel bans and decreased travel continues, relationships erode, leading traders to adopt more automated ways of executing transactions; second, increased retail trade flow makes algos a fit-for-purpose tool relative to this type of trading activity; third, the tools and education offered by providers continues to improve, driving further adoption.

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

Feature	2022	2021
Not answered	▼ 1.63	5.14
0 - 5%	▲ 6.50	3.70
5 - 10 %	▼ 3.25	6.17
10 - 20%	▲ 5.69	4.73
20 - 30%	▼ 4.07	9.05
30 - 40%	▼ 4.07	8.85
40 - 50%	▲ 8.94	8.44
50 - 60%	▲ 15.45	7.82
60 - 70%	▲ 22.76	12.76
70 - 80%	▼ 7.32	12.96
>80%	▼ 20.33	20.37

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

Feature	2022	2021
Other	▼ 4.88	6.58
Implementation shortfall (basket)	▲ 17.89	10.91
TWAP	▲ 37.40	27.16
Implementation shortfall (single stock)	▲ 45.53	44.24
Target Close/Auction Algos	▲ 60.16	
Percentage volume (participation)	▲ 69.11	56.38
VWAP	▲ 79.67	58.64
Dark liquidity seeking	▲ 79.67	67.49

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 hedge funds or using hedge fund 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.

Barclays

Barclays' BARX cross-asset electronic trading platform supports a full suite of core algorithms and covers instruments such as equities, ETFs, fixed income, FX and listed derivatives. The BARX electronic trading team has continued to help buy-side clients drive better trading outcomes throughout the last year, by providing "a deep understanding of individual venue microstructure and order types [which drive] improved liquidity capture and client trading performance", according to the bank's provider submission to the survey. Almost 85% of hedge fund clients responding to Barclays in this year's survey were based in Europe. Approximately 36% represented firms managing assets of over $10 billion, with most of those falling into the $10-50 billion range. Barclay's average score to the survey was 5.76, which represents a 0.17 drop from 2021 and comes in slightly below the survey average of 5.80. On a positive note, the bank outperformed the category benchmarks in six of the 15 service areas under review, the two most significant being customisation (+0.31) and execution consulting (+0.29). In contrast, underperformance was observed across nine areas, most notably in breadth of dark or alternative liquidity sources that are accessed, which scored 47 basis points short of the category average. Dark pool access also represents the bank's largest drop in score (-0.62) as well as its lowest rated category (5.44). Year-over-year declines were recorded in anonymity (-0.59) and algo monitoring (-0.44). Despite scores being marginally down across most categories, year-over-year improvements were observed in three key service areas: including execution consulting and reduced market impact, both gaining 31 basis points this year. Barclay's top service area in 2022 remains ease of use (6.08). Hedge fund clients responding to Barclays tend to use multiple strategies to trade, the most popular being dark or alternative liquidity seeking, POV and VWAP. Around 44% execute over 70% of their trades by algorithms on a daily basis. To measure algo performance, clients use implementation shortfall TCA, liquidity capture and VWAP TCA. In the bank's provider submission to the survey, Barclays comments on "Gator Adapt", its new Implementation Shortfall algo, which "allows clients to manage the trade-off between arrival price slippage and execution price risk".

BARCLAYS RATINGS FOR ALGORITHMIC PERFORMANCE

Increase trader productivity	Reduce market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation	Ease of use
5.93 ▼	6.06 ▲	5.74 ▼	5.87 ▲	5.74 ▼	5.46 ▼	5.45 ▼	5.92 ▼	6.08 ▼

Order routing logic/ analysis	Customer support	Execution consulting	Dark pool access	Flexibility/sophistication of SOR	Algo monitoring	Average score
5.53 ▼	5.82 ▼	6.04 ▲	5.44 ▼	5.81 ▼	5.53 ▼	5.76 ▼

KEY STATS **Category Outperformer:** ★ X6

6.08
Highest score
(ease of use)

5.44
Lowest score
(dark pool access)

0.31
Most improved
(execution consulting)

-0.62
Least improved
(dark pool access)

Berenberg

Berenberg's BEAT offering has continued its momentum as one of the fastest growing electronic franchises in EMEA following a notable year of client acquisition and business development, state the privately-owned bank in its provider submission to the survey. Berenberg received 37 submissions from hedge fund managers this year – up from 29 in 2021 - placing the bank third-highest in terms of number of responses. Responding clients were based mainly in the UK (49%) and Europe (32%), with the remainder based in the US. Close to 30% of these clients manage more than $50 billion in assets. After a stellar performance last year, Berenberg has continued to improve year-over-year. The bank's overall average landed top of the leaderboard at 6.28, up 26 basis points from 2021 and an impressive 48 basis points above the survey average of 5.80. The bank outperformed the benchmark across all fifteen categories and scored higher than all providers profiled in five key areas under review, namely dark pool access (+0.77), execution consulting (+0.68), ease of use (+0.62), execution consistency (+0.58) and customer support (+0.51). Year-over-year improvements were recorded in nearly every category, the most noteworthy being execution consistency, algo monitoring and customisation, which increased by 51, 44 and 42 basis points respectively. The most commonly used strategies among hedge fund clients responding to Berenberg were dark liquidity seeking, VWAP and POV with roughly 60% of clients using either VWAP TCA or implementation shortfall TCA to analyse algo performance. Berenberg notes that scaling and dynamic close algorithms continue to be in high demand. The bank also comments that it has seen "an increase in TAL volumes… as broker technologies integrate with different exchange mechanisms. Clients are subsequently demanding automated interaction via broker algorithms. Client willingness to interact with TAL has resulted in a perception shift as clients are viewing it as a liquidity event rather than a last minute tool to clean up orders". Feedback from respondents was full of praise with comments such as "proactive desk constantly trying to provide colour and feedback," and "high touch overlay is [a] fantastic added service".

BERENBERG RATINGS FOR ALGORITHMIC PERFORMANCE

Increase trader productivity	Reduce market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation	Ease of use
6.18 ▲	6.18 ▲	6.54 ▲	6.06 ▲	6.20 ▲	6.05	6.02 ▲	6.17 ▲	6.62 ▲

Order routing logic/ analysis	Customer support	Execution consulting	Dark pool access	Flexibility/sophistication of SOR	Algo monitoring	Average score
6.24 ▲	6.53	6.42 ▲	6.68 ▲	6.10 ▲	6.24 ▲	6.28 ▲

KEY STATS **Overall Outperformer:** **Category Outperformer:** X15

6.68
Highest score
(dark pool access)

6.02
Lowest score
(price improvement)

0.51
Most improved
(execution consistency)

0.00
Least improved
(anonymity)

Bernstein

Bernstein offers a full suite of trading strategies covering equities and ETF markets, across all regions and continues to expand its global emerging market algo coverage with the addition of several markets across MENA. Bernstein currently supports around 1,100 clients on the buy-side that actively use its algos. Hedge fund clients responding to this year's survey were based mainly across the US (35%), Europe (27%) and the UK (23%), with the remainder located in APAC (15%). In this year's survey Bernstein scored an overall average of 6.05 - down just four basis points from its 2021 score – and lands 25 basis points above the survey average of 5.80. The broker outperformed the benchmarks in all categories under review and scored particularly well in aspects of service such as dark pool access (+0.52) and anonymity (+0.41). Its score for execution consulting (+0.37) came second across all providers profiled in 2022. Year-over-year performance increased across six functional service areas: most notably execution consulting (+0.39) and price improvement (+0.29). The firm's scores dipped most in the categories of data on venue/order routing logic (-0.35), reduce market impact (-0.35) and speed (-0.30). The most commonly used strategies among hedge fund clients responding to Bernstein were VWAP, dark liquidity seeking, POV and MOC with around 70% of clients using either VWAP TCA or Implementation Shortfall TCA to analyse algo performance. In its provider submission to the survey, the broker states that it has "developed enhanced client analytics for implementation and ongoing improvements to client wheel strategies, further optimising Bernstein's performance. In terms of the AUM profile of respondents, roughly 27% of hedge fund clients managed more than $50 billion. Client feedback was largely complementary, with one head of trading full of praise for Bernstein's "top of class, excellent service and anonymity". They continue to state that the "desk works hard to provide quick solutions and provide good suggestions to complex issues".

BERNSTEIN RATINGS FOR ALGORITHMIC PERFORMANCE

Increase trader productivity	Reduce market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation	Ease of use
6.11 ▼	5.95 ▼	6.00 ▼	5.92 ▼	6.03 ▼	6.09 ▲	5.82 ▲	5.93 ▼	6.31 ▲

Order routing logic/ analysis	Customer support	Execution consulting	Dark pool access	Flexibility/sophistication of SOR	Algo monitoring	Average score
5.73 ▼	6.26 ▼	6.12 ▲	6.43 ▲	6.03 ▼	5.95 ▲	6.05 ▼

KEY STATS **Overall Outperformer:** 🏆 **Category Outperformer:** ★ X15

6.43
Highest score
(dark pool access)

5.73
Lowest score
(order routing logic/analysis)

0.39
Most improved
(execution consulting)

-0.35
Least improved
(order routing logic/analysis)

BNP Paribas Exane

BNP Paribas' acquisition of Exane back in mid-2021 has provided the French investment bank with a broader offering, with the addition of prime brokerage, global trading across high touch, portfolio trading and electronic trading, as well as a larger balance sheet. BNP Paribas Exane received 34 responses from hedge fund managers in this year's survey which, in terms of number of responses, places the bank seventh amongst its peers.

BNP Paribas Exane's overall average score of 6.02 outperforms the survey average by 22 basis points, despite having decreased (-0.05) from last year's score. On a category level, the bank outperformed the average score in 12 of the 15 service areas under review and landed top of the leaderboard for data on venue/order routing logic (+0.82), as well as within the top three of all providers profiled for key categories such as execution consistency (+0.37), customisation features (+0.50) and smart order routing (+0.36). The most significant year-over-year score increase for Exane was in data on venue/order routing logic, up 57 basis points from 2021 and at 6.39, is the bank's highest rated category. Despite the bank's outperformance, year-over-year scores declined in 12 aspects of service compared to Exane stellar performance in last year's survey, albeit marginally.

Hedge fund respondents using BNP Paribas Exane's algorithmic trading services were based primarily in continental Europe (76%), with the remainder located in the UK and Hong Kong. Over 26% of hedge fund managers doing business with Exane indicate they have $50 billion or more in AUM and over 80% 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, more dark access, better liquidity seeking and smarter on-day liquidity analysis.

BNP PARIBAS EXANE RATINGS FOR ALGORITHMIC PERFORMANCE

Increase trader productivity	Reduce market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation	Ease of use
6.33 ▼	6.14 ▼	6.33 ▲	5.80 ▼	6.06 ▼	5.79 ▼	5.58 ▼	6.11 ▼	5.94 ▼

Order routing logic/ analysis	Customer support	Execution consulting	Dark pool access	Flexibility/sophistication of SOR	Algo monitoring	Average score
6.39 ▲	6.27 ▼	6.01 ▲	5.77 ▼	6.04 ▼	5.81 ▼	6.02 ▼

KEY STATS Overall Outperformer: Category Outperformer: ★ X12

6.39 Highest score (order routing logic/analysis)

5.58 Lowest score (price improvement)

0.57 Most improved (order routing logic/analysis)

-0.32 Least improved (customer support)

BofA Securities

BofA Securities (previously Bank of America Merrill Lynch) received 35 responses from hedge fund clients in this year's survey, with 40% of those managing over $10 billion in AUM. Overall, BofA recorded a decrease of 27 basis points from 2021, lowering its overall average to 5.57. Decreases were observed in 11 of the 15 categories under review, the most significant being data on venue/order routing logic or analysis (-0.91), customisation features (-0.84) and customer support (-0.77), which in previous year's has been the bank's highest rated service area.

Furthermore, at a score of 5.39, customer support at BofA ranks lowest across all providers provided in the survey, suggesting client levels of satisfaction with personnel and support services are significantly in decline. There is however some good news for the investment bank, as year-over-year increases were observed in four aspects of service, including execution consistency (+0.52) and cost (+0.16). In fact, the category of cost is now BofA's highest rated service area, ranking first across all providers profiled in this year's survey.

BofA outperformed the survey benchmarks in two key categories: cost, which as mentioned, ranked top of the leaderboard, scoring 30 basis points above the category average; and execution consistency (+0.18). In contrast, the bank underperformed across 13 categories, including customisation features (-0.65), customer support (-0.63) and increase trader productivity (-0.50).

Almost 90% of the hedge fund respondents for BofA were from either European or North American markets, with the remainder from Asian centres such as Hong Kong. One UK-based head of equity trading commented that "ease of use [is] lower, as strategies are regional". The most commonly used measures for algorithm performance by hedge fund respondents were implementation shortfall TCA and VWAP TCA. A handful of respondents noted that they implement multiple measures. When asked about additional features wanted, respondents commented that they would like to have further customisation ability as well as further insight and advice regarding their trading strategies.

BOFA SECURITIES RATINGS FOR ALGORITHMIC PERFORMANCE

Increase trader productivity	Reduce market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation	Ease of use
5.45 ▼	5.72 ▲	6.14 ▲	6.16 ▲	5.88 ▼	5.49 ▼	5.07 ▼	4.96 ▼	5.65 ▼

Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility/sophistication of SOR	Algo monitoring	Average score
5.11 ▼	5.39 ▼	5.67 ▲	5.70 ▼	5.62 ▼	5.53 ▼	5.57 ▼

KEY STATS **Category Outperformer:** ★ X2

6.16
Highest score
(cost)

4.96
Lowest score
(customisation)

0.52
Most improved
(execution consistency)

-0.91
Least improved
(order routing logic/analysis)

Citi

US investment bank Citi received 22 submissions from hedge fund managers in this year's algorithmic trading survey, which in terms of number of responses, places the bank 14th amongst its peers. Respondents using Citi's algo trading services were located primarily in the UK (36%), Europe (23%) and the United States (23%), with the remaining 18% based in APAC. In terms of AUM, nearly half (45%) of the respondents represented hedge funds managing over $10 billion. Citi's overall average score of 5.23 underperforms the survey average by a significant 57 basis points and drops 27 basis points below the bank's 2021 score of 5.50. Disappointingly, the firm recorded scores lower than the survey benchmarks across all 15 categories. The most significant being Citi's scores in key areas such as execution consistency (-0.89), data on venue/order routing logic (-0.86) and customisation features (-0.81). Of all the providers profiled in this year's survey, Citi received the lowest score in ten of the 15 service areas under review, in addition to having recorded the lowest overall average score.

In terms of year-over-year performance, client's perception decreased across 13 of the 15 functional service areas, most notably in order routing logic (-0.86), customisation features (-0.74), and flexibility and sophistication of smart order routing (-0.59). On a positive note, Citi increased its year-on-year score in two service categories, namely customer support (+0.26) and reduce market impact (+0.11). Customer support came in as the bank's highest rated category this year (5.85) and along with the majority of categories, fell within the 'Good' range (5.00-5.99).

The most commonly used strategies among hedge fund clients responding to Citi were VWAP, dark liquidity seeking and POV. Performance metrics for algos were relatively evenly split between implementation shortfall TCA, liquidity capture and VWAP TCA. A few respondents noted they use a different approach or multiple. When asked what additional features they would want, respondents noted a desire for more customisation, additional dark access and help improving implementation.

CITI RATINGS FOR ALGORITHMIC PERFORMANCE

Increase trader productivity	Reduce market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation	Ease of use
5.30 ▼	5.47 ▲	5.07 ▼	5.44 ▼	5.61 ▼	5.20 ▼	4.90 ▼	4.80 ▼	5.45 ▼

Order routing logic/ analysis	Customer support	Execution consulting	Dark pool access	Flexibility/sophistication of SOR	Algo monitoring	Average score
4.71 ▼	5.85 ▲	5.23 ▼	5.20 ▼	4.96 ▼	5.20 ▼	5.23 ▼

KEY STATS

5.85
Highest score
(customer support)

4.71
Lowest score
(order routing logic/analysis)

0.26
Most improved
(customer support)

-0.86
Least improved
(order routing logic/analysis)

Credit Suisse

Advanced Execution Services (AES®) is Credit Suisse's suite of algorithmic trading strategies, which offers tools and analytics for global trading across equities, FX and listed derivatives. Credit Suisse received 24 responses from hedge fund clients in this year's survey – with over half (54%) of those from hedge funds managing more than $10 billion in AUM. The bank's average score increased 18 basis points from 2021, raising its overall average to 5.53, yet still ranking 27 basis points below the 2022 survey average of 5.80.

Credit Suisse improved year-over-year scores across ten key categories, the highest improvements were recorded in service areas such as customer support (+0.72), reduce market impact (+0.70), algo monitoring (+0.57) and execution consulting (+0.52). Credit Suisse's highest rated category in 2022 was cost, which recorded a score of 5.89 and outperformed the category average by 3 basis points.

Despite the overall increase in its score from the prior year, the bank fell short of the survey benchmark in 14 of the 15 categories under review, leaving plenty of room for continued improvement. The areas where respondents felt Credit Suisse most significantly underperformed include dark pool access (-0.60), customisation features (-0.55) and order routing logic (-0.41). Overall, the bank recorded scores in the bottom three of all providers profiled in this year's survey in the categories of speed, dark pool access, execution consulting and anonymity. One APAC-based hedge fund manager commented on "inexperienced staff," stating that service had "deteriorated".

Hedge fund respondents using Credit Suisse's AES® were primarily based in the UK (37%), with 29% from the US and the remainder evenly split between Europe and APAC. The most commonly used trading strategies were VWAP, dark liquidity seeking, POV and MOC. Three out of four respondents indicated their use of either implementation shortfall TCA or VWAP TCA to measure algo performance. Comments regarding additional features focused on deeper dark aggregation, help improving implementation, and additional customisation capabilities; with one client noting "it's becoming more challenging to identify differences between algos".

CREDIT SUISSE RATINGS FOR ALGORITHMIC PERFORMANCE

Increase trader productivity	Reduce market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation	Ease of use
5.72 ▼	5.83 ▲	5.82 ▲	5.89 ▲	5.54 ▲	5.31 ▼	5.38 ▲	5.07 ▼	5.86 ▲

Order routing logic/ analysis	Customer support	Execution consulting	Dark pool access	Flexibility/sophistication of SOR	Algo monitoring	Average score
5.16 ▼	5.86 ▲	5.40 ▲	5.31 ▼	5.41 ▲	5.46 ▲	5.53 ▲

KEY STATS **Category Outperformer: ★ X1**

5.89
Highest score
(cost)

5.07
Lowest score
(customisation)

0.72
Most improved
(customer support)

-0.34
Least improved
(dark pool access)

Goldman Sachs

The continued focus for Goldman Sachs Electronic Trading (GSET) has been placed on internalisation and how algo orders can benefit from reduced information leakage, potential price improvement and improved tracking of benchmarks. Goldman Sachs comments that “internalisation rates have grown across the developed markets… [however] emphasis has been on growing internalisation for MENA, where liquidity can be scarce and spreads are naturally wider”. The New York-headquartered investment bank currently has over 550 buy-side clients actively using its algorithms and attracted the highest number of hedge fund responses (47) in this year’s survey.

Responding clients in 2022 were based mainly in the UK (40%) and Europe (38%), with 13% based in North America and the remainder in APAC. Overall, Goldman Sachs' average score of 5.63 represents a slight decrease from its 2021 score of 5.73 (-0.10) and falls 17 basis points below the survey average of 5.80. Year-over-year improvements were recorded in four key categories, the most significant being in reduce market impact (+0.32), while noteworthy decreases were observed in order routing logic (-0.37), flexibility and sophistication of smart order routing (-0.28) and customer support (-0.22). Scores across all categories achieved ratings in the mid-to-high ‘Good’ range (5.00-5.99), despite falling below the survey benchmarks in some areas such as customer support (-0.41), algo monitoring (-0.30) and increase trader productivity (-0.31). The one exception was in the category of customisation features, where Goldman scored 16 basis points above the survey benchmark.

Hedge fund clients managing over $50 billion in assets represented 25% of respondents doing business with Goldman Sachs in the 2022 survey. Nearly 80% of firms looking to the company for trading expertise indicated that they trade at least half of their portfolio volume algorithmically. The most commonly used strategies among hedge fund clients responding to Goldman were VWAP, dark liquidity seeking, POV, TWAP and MOC. Performance measurement metrics were mainly implementation shortfall TCA (34%), VWAP TCA (28%), and liquidity capture (15%). Feedback from respondents included additional insights to better liquidity and further ways to reduce market impact.

GOLDMAN SACHS RATINGS FOR ALGORITHMIC PERFORMANCE

Increase trader productivity	Reduce market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation	Ease of use
5.64 ▼	5.88 ▲	5.70 ▼	5.82 ▼	5.86 ▲	5.40 ▼	5.40 ▼	5.77 ▲	5.79 ▼

Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility/sophistication of SOR	Algo monitoring	Average score
5.30 ▼	5.62 ▼	5.58 ▲	5.76 ▼	5.54 ▼	5.39 ▼	5.63 ▼

KEY STATS **Category Outperformer: ★ X1**

5.88
Highest score
(reduce market impact)

5.30
Lowest score
(order routing logic/analysis)

0.32
Most improved
(reduce market impact)

-0.37
Least improved
(order routing logic/analysis)

Jefferies

Jefferies International offers a comprehensive suite of core algorithms and currently has around 150 buy-side clients actively using its algos to trade equity markets globally. The independent investment bank received 31 responses this year from hedge fund managers – up 18 responses from 2021 – garnering sufficient feedback to be included within this year's provider profiles. Responding clients were based mainly in the US (32%), the UK (29%) and Europe (23%), with 35% of respondents coming from hedge funds with assets of more than $50 billion.

Jefferies achieved an overall average score of 6.18 – up 10 basis points from 2021 - ranking the bank not only an overall outperformer, but also the second-highest rated of all the providers profiled. Jefferies outperformed the benchmarks in all service areas under review and recorded the highest overall score across five key categories: including speed (6.33), reduce market impact (6.32), algo monitoring (6.31), anonymity (6.21) and price improvement (6.10).

In terms of year-over-year performance, respondents reported increases across 12 categories, with the largest improvements being recorded in reduce market impact (+0.46), algo monitoring (+0.34) and price improvement (+0.32). Jefferies recorded year-on-year declines in just three categories: customisation features (-0.19), routing order logic/analysis (-0.15) and flexibility and sophistication of smart order routing (-0.10). The firm's highest score in 2022 remained customer support (6.40), while its lowest score was for order routing logic (5.81), which nevertheless landed 24 basis points above the category average of 5.57.

The most commonly used algos by hedge funds responding to Jefferies in this year's survey were dark liquidity seeking, VWAP, POV, implementation shortfall (single stock) and MOC. To measure algo performance, just over half of clients use implementation shortfall TCA and around 25% use VWAP TCA. Jefferies received some very strong praise for their sales traders, other feedback from respondents focuses on deeper dark aggregation.

JEFFERIES RATINGS FOR ALGORITHMIC PERFORMANCE

Increase trader productivity	Reduce market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation	Ease of use
6.34 ▲	6.32 ▲	6.20 ▲	6.15 ▲	6.33 ▲	6.21 ▲	6.10 ▲	5.98 ▼	6.37 ▲

Order routing logic/ analysis	Customer support	Execution consulting	Dark pool access	Flexibility/sophistication of SOR	Algo monitoring	Average score
5.81 ▼	6.40 ▲	6.11 ▲	6.21 ▲	5.91 ▼	6.31 ▲	6.18 ▲

KEY STATS Overall Outperformer: Category Outperformer: X15

6.40
Highest score
(customer support)

5.81
Lowest score
(order routing logic/analysis)

0.46
Most improved
(reduce market impact)

-0.19
Least improved
(customisation)

JP Morgan

JP Morgan's algorithmic trading suite offers a choice of algorithms to cater for a range of trading styles and objectives across a number of markets, globally. Sixty percent of the participant funds using JP Morgan's algos in this year's survey manage over $10 billion in assets, which is up compared to last year's hedge fund submissions for the bank. Over 60% of hedge funds responding to JP Morgan were based in Europe, 23% in the US and the remainder were located in the APAC region.

JP Morgan achieved an average score of 5.98 which lands 18 basis points above the survey average, qualifying the New York-headquartered investment bank overall outperformer status, as well as a place as category outperformer across all 15 functional service areas under review. Categories such as ease of use (+0.34), customer support (+0.27), customisation features (+0.27) and speed (+0.26) scored particularly well. In terms of year-over-year performance, overall the bank was up 26 basis points from its average score in last year's survey (5.72). Respondents reported higher scores in all categories, bar order routing logic and dark pool access, which were largely flat year-on-year. The largest improvements were seen in the areas of customer support (+0.64), execution consistency (+0.54) and reduce market impact (+0.52). Although JP Morgan received a higher score in the area of price improvement this year, the category remained the bank's lowest rated service area.

JP Morgan received 35 responses from hedge fund managers in this year's survey, which in terms of number of submissions, places the investment bank fifth place among the providers surveyed. Hedge fund respondents reported VWAP, dark liquidity seeking, POV and MOC as the most commonly used trading strategies. Implementation shortfall TCA was the most frequently used algo performance measurement, followed by VWAP TCA. Feedback on requested additional enhancements was largely consistent with other providers. Requests focused on deeper dark aggregation and additional customisation features. In regards to algo monitoring, one UK-based head of trading commented "automated IB alerts not available".

JP MORGAN RATINGS FOR ALGORITHMIC PERFORMANCE

Increase trader productivity	Reduce market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation	Ease of use
6.19 ▲	5.98 ▲	6.11 ▲	5.96 ▲	6.15 ▲	5.81 ▲	5.70 ▲	5.88 ▲	6.34 ▲

Order routing logic/ analysis	Customer support	Execution consulting	Dark pool access	Flexibility/sophistication of SOR	Algo monitoring	Average score
5.73 ▼	6.29 ▲	5.85 ▲	5.98 ▼	5.92 ▲	5.78 ▲	5.98 ▲

KEY STATS **Overall Outperformer:** 🏆 **Category Outperformer:** ★ **X15**

6.34
Highest score
(ease of use)

5.70
Lowest score
(price improvement)

0.64
Most improved
(customer support)

-0.07
Least improved
(order routing logic/analysis)

Kepler Cheuvreux

Kepler Cheuvreux offers a full range of core algorithms, which cover instruments such as ETFs and equities across Europe, North America and LATAM. The agency broker provides electronic trading services to around 350 clients on the buy-side and has recently expanded teams both on the high and low touch sides, along with increasing its quant research team to focus on bespoke client research and solutions. Kepler received 25 responses from hedge fund managers in this year's survey; the same number received in 2021. Of those, 24% represented firms managing assets of over $10 billion. In terms of location, respondents were almost evenly divided between the UK and the major markets of Europe. In this year's survey, Kepler recorded an overall average score of 5.76, down 20 basis points from 2021 and four basis points below the survey average of 5.80. However, Kepler does stand out above the category benchmarks in seven key functional areas, including order routing logic (+0.57), dark pool access (+0.32), algo monitoring (+0.31) and execution consistency (+0.25). Moreover, the broker's scores for order routing logic (6.14) and cost (6.09) landed in the top three of all providers profiles in this year's survey. In contrast, price improvement, ease of use and anonymity underperformed by 68, 66 and 58 basis points respectively. Kepler recorded year-over-year improvements across five key aspects of service. Not surprisingly, the category that showed the most improvement was data on venue/order routing logic or analysis (+0.35), followed by access to dark pools (+0.34). Decreases were observed in a number of categories: most notably in price improvement (-0.96), anonymity (-0.77) and ease of use (-0.76). The most commonly used algos by hedge funds responding to Kepler Cheuvreux in this year's survey were POV, VWAP and dark liquidity seeking. Client feedback included requests for more customisation capabilities and conditional orders. In its provider submission to the survey, Kepler stated that "coming innovations will build on our market leading spread and volatility capture logic through a new quantitatively driven Implementation Shortfall and Liquidity Seeking strategies".

KEPLER CHEUVREUX RATINGS FOR ALGORITHMIC PERFORMANCE

Increase trader productivity	Reduce market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation	Ease of use
5.93 ▼	5.98 ▼	6.21 ▲	6.09	6.14 ▲	5.10 ▼	4.88 ▼	5.39 ▼	5.35 ▼

Order routing logic/ analysis	Customer support	Execution consulting	Dark pool access	Flexibility/sophistication of SOR	Algo monitoring	Average score
6.14 ▲	6.11 ▼	5.29 ▼	6.23 ▲	5.63 ▼	6.01 ▲	5.76 ▼

KEY STATS Category Outperformer: ★ X7

6.23
Highest score
(dark pool access)

4.88
Lowest score
(price improvement)

0.35
Most improved
(order routing logic/analysis)

-0.96
Least improved
(price improvement)

Liquidnet

Liquidnet, now part of interdealer broker TP ICAP, offers buy-side clients a number of core algorithms to trade equities and listed ETFs across markets in APAC, Europe, LATAM and North America. Liquidnet received 26 submissions from hedge fund clients in this year's survey (down from 34 in 2021), 42% of which manage upward of $10 billion in assets. In terms of geographic coverage, 54% of those surveyed were located in the UK, with the remaining 46% evenly split between the US and the rest of the world.

Liquidnet scored an overall average of 5.70 in this year's survey, down 0.24 from its score in 2021 and 10 basis points lower than the survey average of 5.80. The firm outperformed the category average in three aspects of service: including increase trader productivity (+.47), anonymity (+0.11) and reduce market impact (+0.02). Liquidnet's score in the area of increase trader productivity (6.41) was also the highest among all providers surveyed in this report. Despite those areas of success however, the firm either underperformed or matched the benchmark score in the remaining 12 categories: most notably in flexibility and sophistication of SOR (-0.59), order routing logic (-0.32), and cost (-0.26).

Year-over-year improvements were recorded in three categories; execution consistency (+0.26), cost (+0.21) and increase trader productivity (+0.15). Decreases however were observed in the remaining aspects of service, with the most significant occurring in the areas of flexibility and sophistication of SOR (-0.81), dark pool access (-0.56), order routing logic (-0.53) and reduce market impact (-0.49).

Unsurprisingly, hedge fund respondents reported dark liquidity seeking as their most commonly used trading strategy. When asked to note any additional comments, feedback was very positive: one happy client remarked: "Liquidnet find liquidity like no other broker out there. Their own dark pool is extremely helpful especially for the mid-cap space. Their unique coverage system of sales-trader and business development personnel gives the best service on the street."

LIQUIDNET RATINGS FOR ALGORITHMIC PERFORMANCE

Increase trader productivity	Reduce market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation	Ease of use
6.41 ▲	5.91 ▼	5.89 ▲	5.59 ▲	5.66 ▼	5.78 ▼	5.51 ▼	5.40 ▼	5.98 ▼

Order routing logic/ analysis	Customer support	Execution consulting	Dark pool access	Flexibility/sophistication of SOR	Algo monitoring	Average score
5.25 ▼	6.02 ▼	5.59 ▼	5.84 ▼	5.09 ▼	5.64 ▼	5.70 ▼

KEY STATS **Category Outperformer:** ★ X3

6.41
Highest score
(increase trader productivity)

5.09
Lowest score
(flexibility/ sophistication of SOR)

0.26
Most improved
(execution consulting)

-0.81
Least improved
(flexibility sophistication of SOR)

Morgan Stanley

Morgan Stanley Electronic Trading (MSET) offers a broad suite of algorithms to clients on the buy-side and provides global electronic access across cash equities, options and futures. Morgan Stanley received 42 responses from hedge funds – up from 36 in 2021 – placing the New York-headquartered investment bank second amongst the providers rated in this year's survey. Forty-five percent of hedge fund clients surveyed manage assets greater than $10 billion, up from 33% last year.

Morgan Stanley recorded an overall average score of 5.64 this year, 7 basis points down from its score of 5.71 in 2021 and 16 basis points below the survey average of 5.80. Disappointingly, the bank underperformed the survey benchmarks in all 15 categories under review, albeit marginally in some cases. Areas of focus include customisation, execution consulting and order routing logic or analysis, where clients recorded scores of -0.39, -0.29 and -0.29 respectively. On a positive note, improvements were achieved year-over-year in three key categories: namely in the areas of execution consistency (+0.17), price improvement (+0.13) and reduce market impact (+0.11). The most significant year-on-year declines included service areas such as dark pool access (-0.32), order routing logic (-0.31) and customisation (-0.25). Responding hedge fund managers were based in Europe, the UK, the US and APAC at a breakdown of 38%, 31%, 19% and 12% respectively. Clients use a range of strategies to trade, most commonly price improvement strategies such as dark liquidity seeking, plus benchmark algos such as VWAP, POV and MOC. By way of measuring algo performance, respondents primarily use implementation shortfall TCA, followed by liquidity capture and VWAP TCA. Feedback on requested additional enhancements was largely consistent with other providers, with a few respondents expressing desire for further customisation capabilities and dark pool access. One client commented: "Desk coverage has improved, was very stretched at [the] start of 2021".

MORGAN STANLEY RATINGS FOR ALGORITHMIC PERFORMANCE

Increase trader productivity	Reduce market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation	Ease of use
5.76 ▼	5.72 ▲	5.86 ▲	5.70 ▼	5.88 ▼	5.54 ▼	5.49 ▲	5.23 ▼	5.96 ▼

Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility/sophistication of SOR	Algo monitoring	Average score
5.28 ▼	5.78 ▼	5.46 ▼	5.68 ▼	5.65 ▼	5.58 ▼	5.64 ▼

KEY STATS

5.96
Highest score
(ease of use)

5.23
Lowest score
(customisation)

0.17
Most improved
(execution consistency)

-0.32
Least improved
(dark pool access)

RBC Capital Markets

RBC Capital Markets' proprietary algorithmic trading suite offers a comprehensive range of core strategies across multiple asset classes including bonds, equities, ETFs, foreign exchange and listed derivatives. Hedge funds responding to RBC CM in this year's survey were mostly drawn from the larger-cap AUM brackets, with over 56% of clients managing more than $10 billion. In terms of the geographical breakdown respondents were based in the US, the UK and Europe at a split of 44%, 37% and 19% respectively. One hundred percent of responding clients use the bank's algos to trade equities, whilst 63% reported trading at least one other instrument, including ETFs, FX and listed derivatives. RBC CM achieved an average score of 5.89 - the exact same as in 2021 - which lands nine basis points above the survey average, qualifying the global investment bank overall outperformer status. On a category level, RBC outperformed the survey benchmarks across eight key service areas and recorded a survey wide top score in the category of customisation features (+0.65), as well as landing in the top three for price improvement (+0.45) and execution consistency (+0.29). Other notable areas include anonymity and ease of use, which both surpassed the category average by 24 basis points. In contrast, RBC lagged the benchmarks in the remaining seven categories: including dark pool access (-0.17) and execution consulting (-0.14). Year-over-year scores were up in a handful of categories, with significant improvements recorded in execution consistency (+0.61) and price improvement (+0.59). The most significant year-on-year decreases were in anonymity and dark pool access, both of which were rated 37 basis points lower than last year. The most commonly used algos by hedge funds responding to RBC in this year's survey were dark liquidity seeking, VWAP, POV and MOC. By way of measuring performance, respondents primarily use implementation shortfall TCA followed by liquidity capture. When asked to note any additional comments, feedback was extremely positive, with one UK-based trader stating: "RBC have amazing client service from tailoring the trader's needs to checking in daily, they are extremely supportive and very flexible at adapting to one's needs."

RBC CAPITAL MARKETS RATINGS FOR ALGORITHMIC PERFORMANCE

Increase trader productivity	Reduce market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation	Ease of use
5.81 ▼	5.82 ▼	6.24 ▲	5.73 ▼	5.81 ▲	5.91 ▼	6.00 ▲	6.26 ▲	6.24 ▲

Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility/sophistication of SOR	Algo monitoring	Average score
5.76 ▼	6.11 ▼	5.61 ▲	5.74 ▼	5.70 ▼	5.60 ▼	5.89

KEY STATS **Overall Outperformer:** **Category Outperformer:** ★ **X8**

6.26
Highest score
(customisation)

5.60
Lowest score
(algo monitoring)

0.61
Most improved
(execution consistency)

-0.37
Least improved
(dark pool access)

UBS

UBS, an early pioneer of electronic trading, received 36 submissions to its algorithmic trading solutions in this year's survey – down from 38 in 2021 - which in terms of number of responses, ranks the privately-owned investment bank fourth amongst its peers. In terms of regional breakdown, 44% of hedge funds responding to UBS were based in Europe, 28% in the UK, 17% in the US and 11% were located in APAC. Over half (58%) of UBS' hedge fund clients participating in the survey this year manage $10 billion or more in AUM, 31% of which represent firms managing $50 billion and over. UBS received an overall average of 5.48, which represents a slight decrease of 4 basis points from last year's average score of 5.52 and a 32 basis point deficit to the survey average of 5.80. The bank underperformed the survey benchmarks across all but one category this year and recorded scores in the bottom three of all providers profiled across eight aspects of service: including reduce market impact (-0.42), algo monitoring (-0.41) and execution consistency (-0.38). Other notable areas of underperformance include customisation features (-0.57) and price improvement (-0.51). The former came in as the bank's lowest score again this year (5.04), down six basis points from last year. Yet despite receiving relatively low scores, UBS was able to record year-on-year improvements in six key categories, with the largest increases recorded in execution consulting (+0.21), cost (+0.12) and speed (+0.08). Responding hedge fund managers to UBS trade using a range of strategies, most commonly benchmark algos such as VWAP and POV, plus price improvement strategies such as dark liquidity seeking. To measure performance, most clients use implementation shortfall TCA, followed by VWAP TCA and liquidity capture. Over half (55%) of clients surveyed indicated using algorithms to execute more than 60% of trades by volume on a daily basis. Additional features requested by respondents include more customisation, better liquidity seeking and smarter on-day liquidity analysis.

UBS RATINGS FOR ALGORITHMIC PERFORMANCE

Increase trader productivity	Reduce market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation	Ease of use
5.57 ▼	5.47 ▼	5.58 ▲	5.74 ▲	5.91 ▲	5.31 ▲	5.05 ▼	5.04 ▼	5.78 ▼

Order routing logic/ analysis	Customer support	Execution consulting	Dark pool access	Flexibility/sophistication of SOR	Algo monitoring	Average score
5.40 ▼	5.69 ▲	5.53 ▲	5.60 ▼	5.26 ▼	5.28 ▼	5.48 ▼

KEY STATS **Category Outperformer:** ★ X1

5.91
Highest score
(speed)

5.04
Lowest score
(customisation)

0.21
Most improved
(execution consulting)

-0.40
Least improved
(price improvement)

Others

COWEN INC.* 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
6.41	5.67	6.05	5.89	6.07	5.51	5.62	6.07

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	5.85	6.20	5.67	5.93	5.78	6.06	5.93

INSTINET RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
6.14 ▲	6.23 ▲	6.11 ▲	5.92 ▼	5.31 ▼	5.57 ▼	5.74 ▲	5.39 ▼

Ease of use	Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of SOR	Algo monitoring	Average score
6.22 ▲	5.13 ▼	6.06 ▼	5.77 ▼	6.62 ▲	6.14 ▼	5.84 ▲	5.88 ▼

REDBURN RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
6.01 ▼	5.83 ▼	6.04 ▼	5.77 ▲	5.82 ▼	6.05 ▼	5.98 ▲	5.90 ▲

Ease of use	Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of SOR	Algo monitoring	Average score
6.19 ▼	6.10 ▲	6.38 ▲	5.87 ▲	6.52 ▼	5.89 ▼	5.88 ▼	6.02 ▼

VIRTU FINANCIAL RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
6.18 ▼	5.81 ▲	5.90	5.56 ▼	5.66 ▼	5.67 ▼	5.61 ▲	5.20 ▲

Ease of use	Order routing logic/analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of SOR	Algo monitoring	Average score
5.84 ▼	5.09 ▼	5.98 ▼	5.42 ▲	5.93 ▼	5.65 ▼	5.46 ▲	5.66 ▼