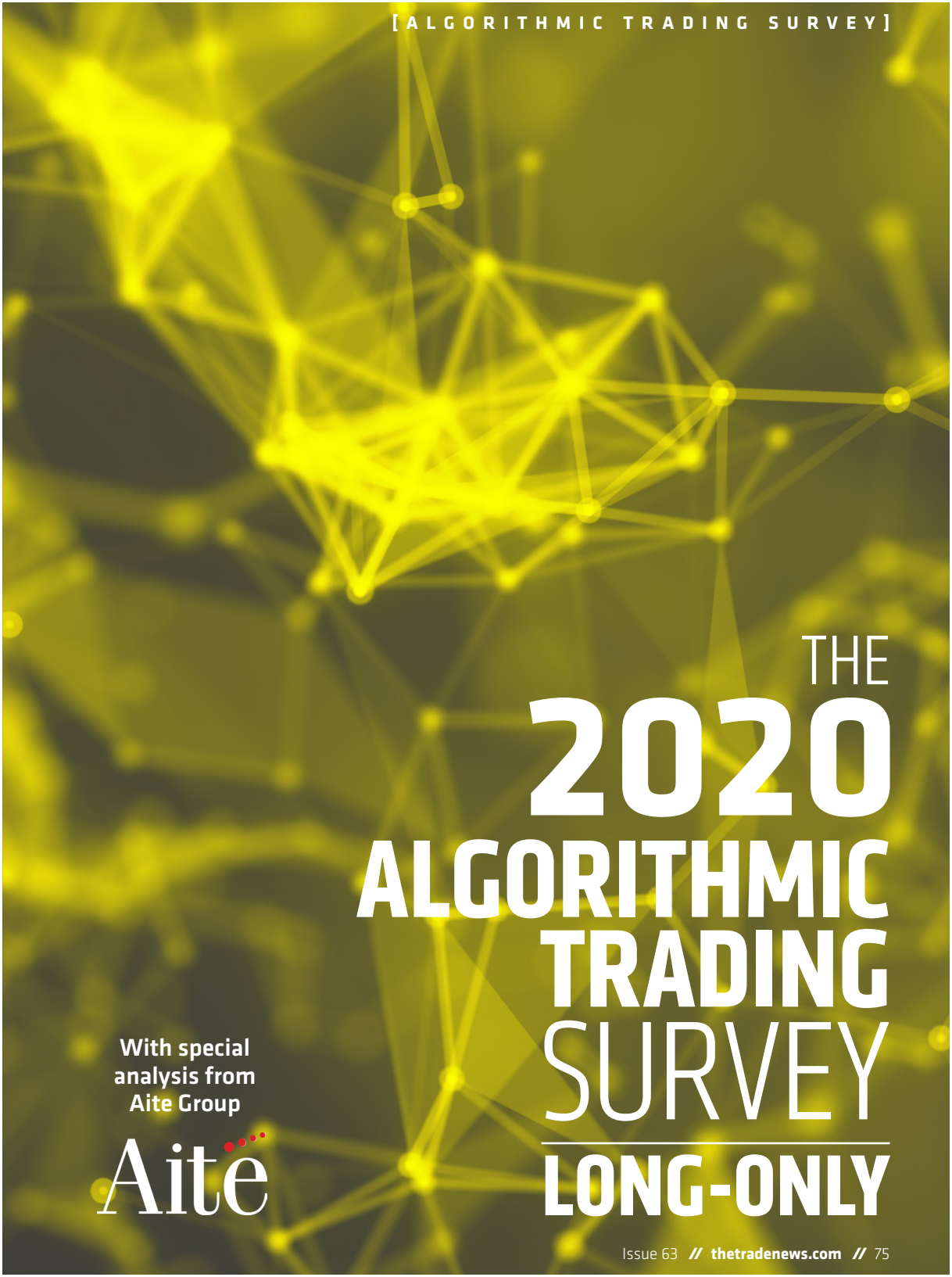


THE 2020 ALGORITHMIC TRADING SURVEY

LONG-ONLY

With special analysis from Aite Group

Aite

Brokers bolster algo access to dark pools and liquidity for buy-side

The long-only results of The TRADE's 2020 Algorithmic Trading Survey show that dark pool access remains a key focus for asset managers, as providers see largest jump in score in connecting the buy-side to dark liquidity.

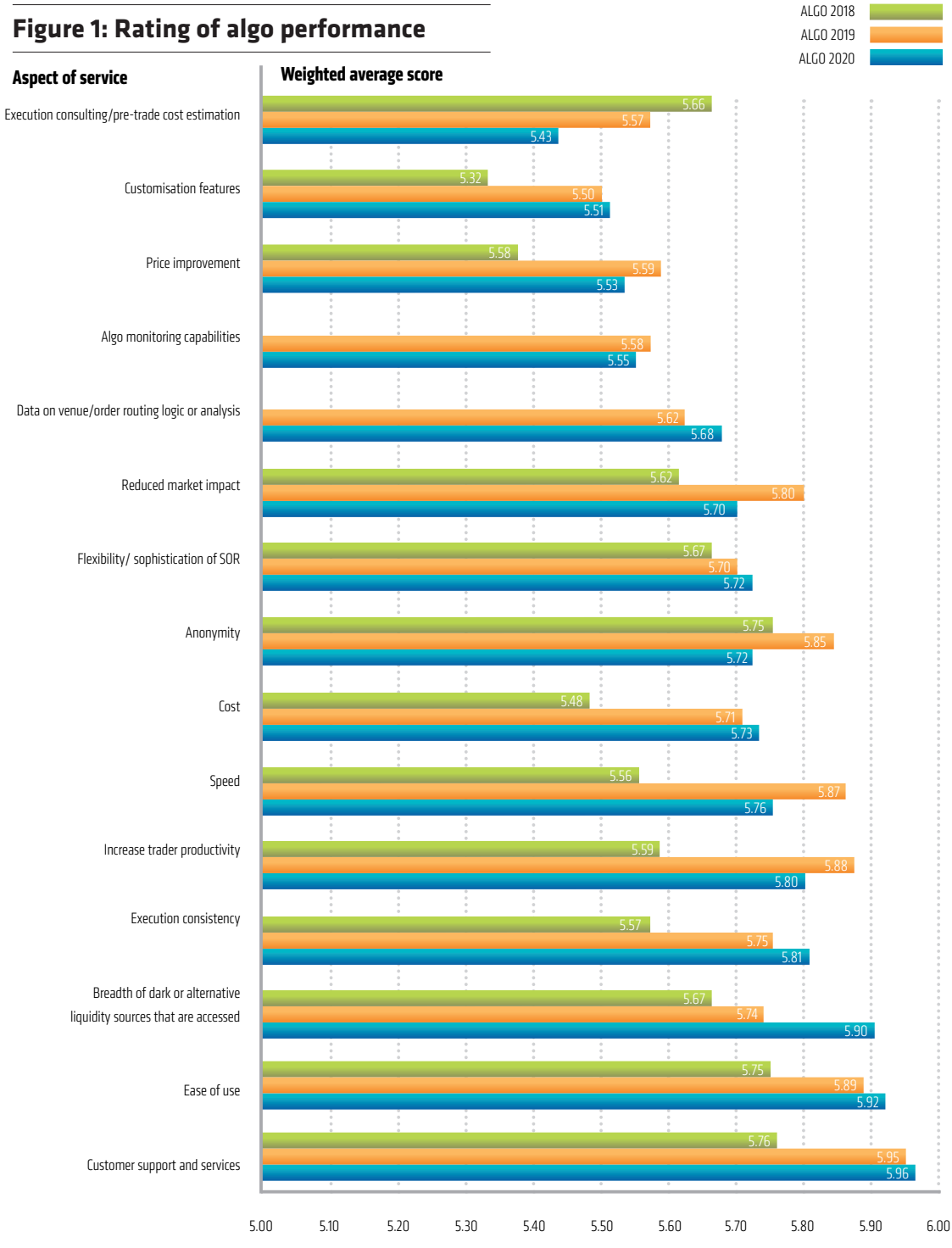
On the whole, 2019 was a very good year for global equity markets. Passive investing and indexing continued to tick along while the major US indices recorded new highs—the year ended with three rate cuts in the US helping to fuel the largest gains since 2013. Likewise, European markets had their best year in a decade. Many of the fears worrying investors never realised—the global recession never arrived, trade wars didn't deter investment, Brexit didn't implode the market, and World War III wasn't on the horizon after all. Taken together, a robust market, stringent best execution requirements, and improved decision support created a favorable environment for algorithms.

The average score of long-only survey respondents is 5.71 in 2020—a slight decrease from the 2019's score of 5.74 (up from 5.60 in 2018). In 2020, the most impactful features of algorithms are customer support and services, ease of use, dark pool access, execution consistency, and increased trader productivity (Figure 1). Support services, which draw the highest score of 5.96, also attracted relatively high marks in 2019's survey (5.95). Being able to get ahold of a broker supporting the algo suite is a top priority for the buy-side. Ease of use, a category that has been improving over the past three years, garners the second-highest mark of 5.92 (versus 5.89 in 2019) as technology becomes more user-friendly and streamlined, such as the automation of trades engaging algos that originated in order/execution management systems.

Dark pools continue to make their mark

Dark pool access continues to be an important area for market participants' algo use. The largest jump in score is linked to this capability (5.90 in 2020 versus 5.74 a year ago). Brokers continue to offer a greater range of connectivity and provide access to liquidity as the number of dark pools and amount of dark liquidity continue to increase. Algos are being used more effectively to manage greater amounts of fragmented liquidity, and market participants are increasingly satisfied with the results. Execution consistency marks the second-highest jump in year-over-year scoring (5.81 in 2020 versus 5.75 in 2019), likely a consequence of calmer seas (e.g., the Cboe VIX averaged 15.39 vols in 2019 compared to 16.64 in 2018) coupled with improved decision support. Lastly, increased trader productivity receives a score of 5.80, down from 5.88 in 2019. While there is no doubt algos improve front-office productivity, at a point, diminishing returns to

Figure 1: Rating of algo performance



production are likely.

Simple and fast still matters

Respondents' reasons for using algos, presented in Figure 2 as a percentage of responses, differ between 2020 and 2019. Overall, increases are seen in six areas of algo trading this year versus last: ease of use, increased trader productivity, greater anonymity, smart order routing, routing logic, and pre-trade estimates. Meanwhile, decreases are observed in seven categories over the same period: consistency of execution performance, the reduction of market impact, algo monitoring, lower commission rates, better prices, higher speed, and customisation. Thus, net/net, there is a greater focus on working orders quickly, easily, and in a sophisticated manner that protects information leakage. There is less emphasis being placed on (implicitly/explicitly) cheaper algos, those that are faster than others, or those that can be highly customised to provide a consistent and superior outcome.

Figure 2: Reasons for using algos (% of respondents)

Feature	2020	2019	2018
Ease-of-use	11.08	10.98	14.57
Consistency of execution performance	10.51	11.25	13.69
Increase trader productivity	10.45	10.05	11.29
Reduce market impact	10.29	10.98	11.93
Greater anonymity	9.93	7.64	9.18
Flexibility and sophistication of smart order routing	8.02	7.59	n/a
Algo monitoring capabilities	7.20	7.64	n/a
Lower commission rates	6.83	8.28	7.98
Better prices (price improvement)	6.65	7.13	7.78
Higher speed lower latency	6.56	6.81	7.90
Customisation capabilities	5.74	6.39	7.74
Data on venue/order routing logic or analysis	5.07	4.14	n/a
Results match pre-trade estimates	1.67	1.12	3.27

"One and done" may be a relic of the past

Across the board, it is evident that long-only funds of varying assets under management (AUM) are mostly looking to at least two algo providers (Figure 3). From a diversification and business-continuity perspective, managers are likely unwilling to place all of their eggs in one basket and risk a provider outage. The smallest firms, including those managing up to US$1 billion, appear to be comfortable with using roughly two providers. Larger firms, such as those with an AUM range of US$1 billion to US$10 billion, likely rely on three. The largest firms with AUM over US$10 billion work with about four algo providers.

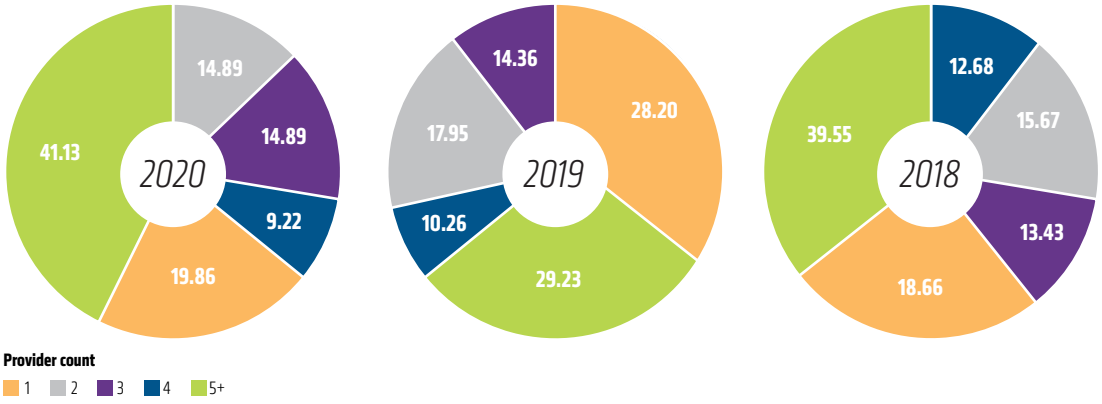
Digging into the details a bit, long-only managers with US$0.25 billion to US$0.5 billion in AUM show a year-over-year decrease in the number of algo providers, falling to 1.83 in 2020 from 2.20 in 2019, on average. No doubt, cost pressures have kept them from opening up the purse strings to engage with additional providers. Likewise, larger managers with over US$50 billion in AUM have also scaled back and consolidated their relationships to an average of 4.02 providers this year from 4.45 in 2019. While having four providers still appears to be a well-diversified strategy, adding more (e.g., equity algo providers) may have diminishing returns in light of limited commission budgets to pay for research and other services.

Larger managers are generally more likely to be motivated to use several algo providers, given the resources they are able to put to work as well as the requirements necessary for managing a multi-asset class portfolio. Looking beyond equity algorithms, the rise of algo use in the foreign exchange (FX) asset class has grown over the years for spot trading and, recently, has begun to extend to FX derivatives such as non-deliverable forwards. New regulations, such as the uncleared margin rules, are driving FX derivatives into the

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

Feature	2020	2019	2018
Not answered	3.42	2.33	2.87
Up to 0.25	2.14	2.13	2.50
0.25-0.5	1.83	2.20	2.17
0.5-1	2.00	1.43	2.50
1 to 10	3.33	2.90	3.64
10 to 50	4.25	3.73	4.26
More than 50	4.02	4.45	4.41

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



clearinghouse and fostering more electronic trading. The development of new algos is a natural extension of this phenomenon. Thus, it may be that these managers are holding the number of algo providers somewhat consistent while diversifying the types of algos used by asset class and strategy.

Stripping away the AUM filter on the number of providers selected by long-only managers yields some interesting results (Figure 4). This year's survey suggests long-only managers are either all in when it comes to committing resources to algos or sticking with two or so providers. The population of participants indicating they are "one and done" has shrunk year-over-year and is now only 19.86% of managers versus 28.2% in 2019. This trend is likely driven by managers looking to mitigate counterparty risk. Deutsche Bank's July 2019 announcement that it would exit global equities trading, cutting 18,000 jobs and transferring 75 billion euros in risk-weighted assets as part of a major overhaul, drives this point.

The group of firms relying on five or more algo providers has grown substantially in the past 12 months. In 2019, 29.23% of participants fell into this group. This year, a whopping 41.13% of surveyed firms have a large group of providers they work with. The reason for this is two-fold. On one hand, a combination of business relationships and specialised tech (offering better features and functionality that foster ease of use, consistent execution, and enhanced trader productivity—all buttressed by better customer support) may be the likely driver. Alternatively, fund managers may need to pay a wider number of providers for research and other broker-provided services, which pushes them to take on additional algo providers.

Just because you can do it doesn't mean you should

The distribution of algo usage by value traded has changed since 2019 (Figure 5). For example, the group of managers trading roughly 50% to 60% of their portfolio using algos has increased to 22.16% of participants from 9.85% 12 months ago. This group represents the largest percentage of survey participants, edging close to one-quarter of managers. Additionally, the year-over-year increase is the largest of any bracket. Similarly, long-only funds allocating 40% to 50% of their portfolio value into algos grew to 12.75% from 7.06% a year ago—the second-largest increase of any bracket. At the lower end of the spectrum, 8.43% of participants trade 5% to 10% of their portfolio's value using an algorithm (versus 4.76% 12 months ago). Increases are also apparent in the 20% to 30% bracket, where 7.65% of long-only funds increased the value of their portfolios traded by algos from 5.25% over the same period.

There is a perception that more firms are pushing a larger percentage of their book into algorithms, and this will likely continue, even beyond equities. However, firms prefer to balance the amount of trading that is algorithmically dealt against other means of transacting. The percentages of funds have fallen in all of the three largest categories: 60% to 70%, 70% to 80%, and over 80%. In some cases, managers may have discovered through trial and error that algos are not right for every instrument that can be algorithmically traded. In these instances, cost factors such as execution consistency and market impact may have fallen short of expectations.

Long-only managers were asked to select the types of algorithms they used from providers (Figure 6). In 2020, the highest concentration of surveyed

long-only funds turned to dark liquidity-seeking algos (72.94%)—a trend that has been increasing in recent years and highlights an evolution in trading performance. Algos that have been in existence for years, including volume weighted average price (VWAP), time weighted average price (TWAP), and implementation shortfall (IS), may be gamed and thus might not offer much benefit in terms of improving trading performance. However, navigating all of the execution venues and using dark liquidity-seeking tools, along with customised smart order routing, may offer significant advantages and outperform alternative options.

Over half of surveyed participants indicate they use VWAP algos (54.71%), a figure that has mildly declined over the past few years. Nearly as many managers also employ implementation shortfall for single stock algos (53.14%)—a percentage that has ticked higher as of late and is likely the result of providers emphasising greater variation in their offerings. Lastly, although the percentage-of-participation algos are used by nearly half of the respondents (49.02%), there has been a decline in usage year-over-year as preferences shift.

Figure 5: Algo usage by value trader (% of responses)

Feature	2020	2019	2018
Not Answered	1.96	5.09	4.27
0-5%	4.71	6.08	5.69
5-10%	8.43	4.76	5.28
10-20%	6.08	11.17	9.56
20-30%	7.65	5.25	11.18
30-40%	9.22	9.69	12.19
40-50%	12.75	7.06	14.02
50-60%	22.16	9.85	8.13
60-70%	9.61	14.61	9.76
70-80%	6.47	10.18	9.76
80% and over	10.98	16.26	10.16

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

Feature	2020	2019	2018
% Volume (participation)	49.02	60.92	59.55
Dark liquidity seeking	72.94	59.11	54.27
Implementation shortfall (basket)	13.92	16.42	14.43
Implementation shortfall (single stock)	53.14	45.32	35.98
Other	5.10	3.45	6.30
Target close/auction algos	0.00	0.33	0.00
TWAP	24.71	21.51	28.46
VWAP	54.71	63.87	55.69

Methodology

Long-only buy-side survey respondents were asked to give a rating for each algorithm provider on a numerical scale from 1.0 (very weak) to 7.0 (excellent), covering 15 functional criteria.

In general, 5.0 is the 'default' score of respondents. In total, just under 30 providers received responses and the leading providers obtained dozens of evaluations, yielding thousands of data points for analysis. Only the evaluations from clients who indicated that they were engaged in managing long-only firms 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. Lastly, this year's survey analysis for the long-only results were carried out by Aite Group.

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Bank of America

Bank of America (BofA) is a Charlotte, North Carolina-headquartered investment bank operating in 35 countries. BofA offers a wide range of execution capabilities to help traders improve performance versus benchmarks, reduce market impact, and maximise efficiency on the desk. These include algorithmic trading strategies, smart order routing, and direct market access (DMA).

BofA ranks 10th by number of long-only fund responses received (29), moving up two notches from 2019's survey. Sixty percent of the funds that rely on BofA for algo execution indicate they trade at least half of their portfolio value by algorithmic means.

About one-third (34%) of participants manage over US$50 billion in assets. BofA has improved year-over-year in four categories: execution consistency (0.11), customisation (0.33), ease of use (0.34), and algo monitoring capabilities (0.07). The firm's average score of 5.43 is 12th among peers and represents a 0.10 decline versus 12 months ago.

Year-over-year decreases are also observed in a number of other categories, including increased trader productivity, reduced market impact, cost, speed, anonymity, price improvement, data on venue/order routing logic or analysis, customer support, dark pool access, and flexibility and sophistication of smart order routing.

BANK OF AMERICA RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
5.42	5.16	5.62	5.36	5.50	5.55	5.26	5.06

Ease of use	Data on venue/order routing logic or analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of smart order routing	Algo monitoring capabilities
5.73	5.41	5.71	5.37	5.51	5.44	5.38

KEY STATS

5.73
Highest score
(ease of use)

5.06
Lowest score
(customisation)

0.34
Most improved
(ease of use)

-0.45
Least improved
(anonymity)

Bernstein

Bernstein Trading (Bernstein), a wholly owned subsidiary of AllianceBernstein L.P., provides best-in-class fundamental research and full-service execution services to institutional clients globally. Bernstein's algorithmic offering comprises a suite of trading strategies, developed in-house, that maximise access to all available sources of liquidity while dynamically reacting to market conditions. Bernstein's team of quantitative researchers employ advanced measures to optimise venue selection.

Bernstein receives the second-highest number of responses from long-only funds (38). Twenty-one percent of Bernstein's clients that participated in this year's survey manage over US$50 billion in assets. As a group, 50% say they trade at least half of their portfolio value algorithmically. Bernstein ranks first in three categories versus peers in 2020: cost (6.14), anonymity (6.16), and customer support (6.52). It also achieves the second-highest ranking in five different areas: increased trader productivity (6.18), reduced market impact (6.08), execution consistency (6.15), ease of use (6.30), and average score (5.99). Finally, Bernstein has the third-highest ranking in customisation (5.87), dark pool access (6.20), and flexibility and sophistication of smart order routing (5.99). Compared to last year, Bernstein's scores have improved in two areas: ease of use (0.17) and execution consistency (0.10). Scores are flat to lower in all other categories.

BERNSTEIN RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
6.18	6.08	6.15	6.14	5.90	6.16	5.58	5.87

Ease of use	Data on venue/order routing logic or analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of smart order routing	Algo monitoring capabilities
6.30	5.56	6.52	5.63	6.20	5.99	5.57

KEY STATS

6.52
Highest score
(customer support)

5.56
Lowest score
(data on venue/ order routing)

0.18
Most improved
(ease of use)

-0.42
Least improved
(execution consulting)

Citi

Citigroup (Citi) is a New York-headquartered bank with a physical presence in 98 countries and trading desks in 77 markets. Citi's trading platform offers DMA-capable online execution to markets across the Americas, Europe, the Middle East, Africa, and the Asia-Pacific. Citi's smart order router and algorithms utilise several routing strategies. They are specialised for seeking liquidity in passive, aggressive, and opportunistic modes, utilising both lit and dark venues.

Citi ranks 12th in relation to the number of responses (22) from surveyed long-only funds that look to the bank as their algo provider. Fifty-six percent of fund managers indicate they trade over half the value of their portfolio using algorithmic means. The majority, or 59%, manage assets over US$50 billion. Citi was not profiled in last year's report, as the bank received insufficient responses at that time. The company's highest score is in customer support (5.80), which ranks eighth among firms. The bank's lowest score of 5.12 is attributed to execution consulting, for which it ranks last among peers. Overall, an average score of 5.42 is also last in the group.

CITI RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
5.28	5.43	5.43	5.64	5.55	5.40	5.15	5.15

Ease of use	Data on venue/order routing logic or analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of smart order routing	Algo monitoring capabilities
5.65	5.36	5.80	5.12	5.68	5.43	5.29

KEY STATS

5.80
Highest score
(customer support)

5.12
Lowest score
(execution consulting)

0.68
Most improved
(dark pool access)

-0.45
Least improved
(execution consulting)

Exane BNP Paribas

Founded in 1990, Exane Group is one of the main investment companies in Europe, specialising in cash equities, derivatives, and asset management. Headquartered in Paris, the firm's cash equities business operates under the brand name Exane BNP Paribas (Exane). The group provides institutional investors with a range of services, such as research, sales, and execution in European equities. Additionally, it offers a full suite of trading products across high-touch trading, electronic trading, exchange-traded funds, and program trading.

Exane ranks seventh among algorithmic providers in relation to the number of responses, receiving 34 responses from long-only managers. Fifty-five percent of the 34 funds captured in the survey results trade at least half of the value of their portfolio algorithmically. Forty-four percent of managers doing business with Exane indicate they have US$50 billion or more in AUM.

Exane has the highest average score of all providers profiled (6.17) and ranks first across ten categories in this year's survey: increased trader productivity (6.22), execution consistency (6.20), speed (6.26), price improvement (>6.00), customisation (6.34), ease of use (6.34), data on venue/order routing logic or analysis (6.19), execution consulting (6.09), flexibility and sophistication of smart order routing (6.31) and algo monitoring capabilities (6.12). Additionally, Exane BNP Paribas ranks second in customer support (6.33) and third in cost (5.96). The majority of categories show improvements over last year's rankings, with an increase of 0.07 in Exane's overall average.

EXANE RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
6.22	5.95	6.20	5.96	6.26	5.91	6.00	6.34

Ease of use	Data on venue/order routing logic or analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of smart order routing	Algo monitoring capabilities
6.34	6.19	6.33	6.09	6.32	6.31	6.12

KEY STATS

6.34
Highest score
(ease of use)

5.91
Lowest score
(anonymity)

0.50
Most improved
(execution consulting)

-0.49
Least improved
(anonymity)

Goldman Sachs

Goldman Sachs Group Inc. (Goldman Sachs) is a leading global investment banking, securities, and investment management firm headquartered in New York. Goldman Sachs Electronic Trading (GSET) offers a suite of algorithms, including liquidity-seeking, benchmark-matching, and dynamic volume participation, as well as a smart order router. Goldman Sachs offers clients access to a suite of global liquidity pools, such as SIGMA-X, which is enhanced by its algo execution capabilities.

Goldman Sachs attracts the third most long-only fund responses (36) in the survey. Clients managing over US$50 billion in assets represent 35% of respondents doing business with Goldman Sachs in 2020. Sixty-one percent of firms looking to the company for trading expertise indicate they trade at least half of their portfolio value algorithmically. Comparing this year's rankings with those of 2019 shows improvements across all categories. Participants rank Goldman Sachs third in terms of speed, an increase of 0.42 in that category. The company has an average score of 5.70, which ranks eighth among peers, increasing 0.35 over the past 12 months.

GOLDMAN SACHS RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price Improvement	Customisation
5.75	5.41	5.82	5.95	5.91	5.50	5.29	5.42

Ease of use	Data on venue/order routing logic or analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of smart order routing	Algo monitoring capabilities
5.88	5.72	5.74	5.57	5.76	5.91	5.82

KEY STATS

5.95
Highest score
(cost)

5.29
Lowest score
(price improvment)

0.96
Most improved
(algo monitoring capabilities)

-0.06
Least improved
(data on venue/ order routing)

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. Its global trading platform includes algorithms, routing functionality, transaction analytics, and other trading tools. Instinet's Execution Experts are event-driven, multi-asset algorithmic trading strategies.

Instinet is ranked the eighth provider out of 13 firms by number of responses. Thirty-three long-only managers indicate they rely on Instinet for execution algos. Fifty-eight percent of managers who selected Instinet as a provider execute at least half of their portfolio value algorithmically. Nearly one-third (30%) manage upwards of US$50 billion in assets.

Instinet receives high marks in three categories—increased trader productivity (6.15), reduced market impact (6.05), and anonymity (5.93)—ranking third in each area according to 2020 survey results. Year-over-year, the company sees increased scores in several areas, most notably, increased trader productivity (0.30), dark pool access (0.29), and anonymity (0.24). Ease of use and execution consulting are two areas for which the company has received declining marks versus 12 months ago.

INSTINET RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
6.15	6.05	5.82	5.95	5.86	5.93	5.65	5.35

Ease of use	Data on venue/order routing logic or analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of smart order routing	Algo monitoring capabilities
5.80	5.79	6.21	5.37	5.97	5.95	5.56

KEY STATS

6.21
Highest score
(customer support)

5.35
Lowest score
(customisation)

0.30
Most improved
(increase trader productivity)

-0.31
Least improved
(execution consulting)

Jefferies

Jefferies Group LLC (Jefferies) is a US-based multinational independent investment bank and financial services company headquartered in New York. The firm provides clients with a full range of investment banking, advisory, sales and trading, research, and wealth management services across all products in the Americas, Europe, and Asia. Jefferies Group LLC is a wholly owned subsidiary of Jefferies Financial Group Inc., a diversified financial services company.

Jefferies' algo suite includes liquidity solutions such as SEEK, DarkSEEK, BLITZ, and Patience. The company also offers a variety of benchmark solutions, workflow solutions, and list-based algos. In 2019, Jefferies continued to innovate and deliver new algorithmic solutions to clients; examples include a high-discretion adaptive algo called JUMBO and an innovative approach to liquidity capture in and around the close called TOUCHDOWN. The firm has seen an uptick in usage of portfolio-level models this year offering a wide degree of functionality and flexibility to clients, as well as in its pairs (spread) trading strategies.

Jefferies garners the fourth-highest number of long-only fund responses (36) in this year's survey. Sixty percent of clients say they trade at least half of their portfolio value algorithmically. Meanwhile, 41% of respondents doing business with Jefferies and captured in this year's survey manage US$50 billion or more in assets. The firm receives an average score of 5.88—also fourth among peers. Jefferies has the third-highest score in the category of execution consulting (5.66). Although the company receives a high number of responses and some standout rankings, most scores are mildly lower than last year's statistics, with the largest declines popping up in speed and algo monitoring capabilities.

JEFFRIES RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
6.11	5.91	5.95	5.76	5.91	5.72	5.60	5.75

Ease of use	Data on venue/order routing logic or analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of smart order routing	Algo monitoring capabilities
6.14	5.72	6.23	5.66	6.02	5.90	5.75

KEY STATS

6.23
Highest score
(customer support)

5.60
Lowest score
(price improvment)

n/a
Most improved
(n/a)

-0.41
Least improved
(speed)

JP Morgan

JP Morgan is a New York-headquartered investment bank. The company has a presence in over 100 markets, with over 250,000 employees. JP Morgan offers clients a variety of equity algos, including Aqua for equities, Aqua Blocks for accessing block liquidity, and JPM-X, a fully dark continuous crossing platform. The bank's FX algos have gotten a lot of attention as of late and include a hybrid FX algo offering designed to manage cost and access liquidity.

JP Morgan ranks ninth on the list of algorithmic trading solutions providers, receiving 32 responses from long-only managers. Nearly half (49%) of the participating funds using JP Morgan's algos manage over US$50 billion in assets, and 62% trade at least half of their portfolios' value algorithmically. JP Morgan's scores have increased in every category year over year. Most notably, the largest gains are observed in customer support (0.96), algo monitoring capabilities (0.77), execution consistency (0.65), and cost (0.60). With an average score of 5.77, JP Morgan garners 0.06 above the survey average. The company ranks sixth versus other algo providers, up 0.49 from 12 months ago.

JP MORGAN RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
5.68	5.48	5.83	5.76	5.81	5.72	5.52	5.60

Ease of use	Data on venue/order routing logic or analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of smart order routing	Algo monitoring capabilities
6.09	5.86	6.10	5.63	5.91	5.72	5.83

KEY STATS

6.10
Highest score
(customer support)

5.48
Lowest score
(reduced market impact)

0.96
Most improved
(customer support)

0.20
Least improved
(reduce market impact)

Liquidnet

Liquidnet is a New York-based global institutional investment network that connects asset managers with liquidity. Liquidnet trades in 46 equity markets for over 1,000 institutional investment firms. The company offers a range of execution solutions, workflows, and liquidity-sourcing techniques in equities and fixed income trading.

Liquidnet receives the most responses by long-only managers surveyed (42). Twenty-six percent of clients looking to Liquidnet for trading expertise manage over US$50 billion in AUM. Fifty-five percent of clients captured in this year's survey trade at least half of the value of their portfolio algorithmically. The company has an average score of 5.70, which ranks it seventh in the algo provider peer group.

Liquidnet receives the highest ranking of all firms in two categories: reduced market impact (6.11) and dark pool access (6.42). It also scores the second-highest mark in anonymity (6.09). Lastly, Liquidnet achieves the third-highest ranking in two areas: price improvement (5.78) and customer support (6.24). Broadly speaking, Liquidnet shows improved scores in most categories this year, with the following important upticks: dark pool access (0.61), data on venue/order routing logic or analysis (0.54), speed (0.19), and anonymity (0.18). The company also sees a notable decline in execution consulting (0.23) year-over-year.

LIQUIDNET RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
5.84	6.11	5.73	5.32	5.52	6.09	5.78	5.14

Ease of use	Data on venue/order routing logic or analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of smart order routing	Algo monitoring capabilities
5.78	5.57	6.24	5.29	6.42	5.43	5.28

KEY STATS

6.42
Highest score
(dark pool access)

5.14
Lowest score
(customisation)

0.61
Most improved
(dark pool access)

-0.23
Least improved
(execution consulting)

Morgan Stanley

Morgan Stanley is a New York-headquartered investment bank with over 60,000 global employees and 500 offices worldwide. 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.

Morgan Stanley receives 23 responses from long-only fund participants, ranking 11th among the peer group, unchanged from last year. Fifty-eight percent of participants doing business with Morgan Stanley indicate they trade at least half of the value of their portfolio algorithmically. Over one-third (42%) manage assets greater than US$50 billion. This year, Morgan Stanley ranks second among peers in the cost category—an improvement of 0.47 from last year's score. Cost improvement shows the largest increase in scoring of any category. Significant year-over-year improvement (0.42) is observed in the algo monitoring capabilities category, for which Morgan Stanley receives a ranking of 5.75 this year.

Nearly all the remaining categories show improvement as well, although to a lesser extent: reduced market impact, execution consistency, speed, anonymity, price improvement, ease of use, data on venue/order routing logic or analysis, customer support, execution consulting, dark pool access, and flexibility and sophistication of smart order routing. Two areas—increased trader productivity and customisation—show declines. Finally, the company's average score of 5.66 ranks it ninth among peers and represents an improvement of 0.17 versus 12 months earlier.

MORGAN STANLEY RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price Improvement	Customisation
5.66	5.71	5.89	6.05	5.76	5.72	5.51	5.35

Ease of use	Data on venue/order routing logic or analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of smart order routing	Algo monitoring capabilities
5.98	5.40	5.46	5.24	5.85	5.65	5.75

KEY STATS

6.05
Highest score
(cost)

5.24
Lowest score
(execution consulting)

0.47
Most improved
(cost)

-0.20
Least improved
(customisation)

RBC Capital Markets

RBC Capital Markets (RBC) is headquartered in Toronto and has 70 offices located in 15 countries worldwide. The bank's global Electronic Trading team comprises of traders, quantitative developers, and market specialists. THOR is RBC's smart order routing technology designed to improve execution quality, minimise information leakage, and control trading costs. THOR interacts with RBC's algorithm suite as well as DMA orders, cash desks, and program trades.

RBC receives 21 responses from long-only fund participants, ranking 13th among algo providers. The company was not profiled in last year's survey report. Fifty-four percent of participant funds trade 50% or more of their portfolio using RBC's algorithms. More than one-quarter (26%) of RBC's clients represented in this survey manage US$50 billion or more. The company is tied for first place in the price improvement category (6.00) and ranks second-highest in speed (6.03), customization (6.05), execution consulting (5.79), flexibility and sophistication of smart order routing (6.04), and algo monitoring capabilities (5.93). RBC ranks third in ease of use (6.16, its highest score), data on venue/order routing logic or analysis (5.80), and average score (5.94). Its lowest score is for cost (5.77).

RBC CAPITAL MARKETS RATINGS FOR ALGORITHM PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
5.92	5.82	5.98	5.77	6.03	5.80	6.00	6.05

Ease of use	Data on venue/order routing logic or analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of smart order routing	Algo monitoring capabilities
6.16	5.80	6.15	5.79	5.95	6.04	5.93

KEY STATS

6.16
Highest score
(ease of use)

5.77
Lowest score
(cost)

0.44
Most improved
(dark pool access)

-0.20
Least improved
(cost)

UBS

UBS Group AG (UBS) provides financial advice and solutions to wealthy, institutional, and corporate clients worldwide as well as private clients in Switzerland. Headquartered in Zurich, UBS has offices in over 50 regions and locations, including all major financial centers, and employs approximately 67,000 people. UBS provides access to unique liquidity, algorithms, execution consultancy, performance analysis, and market structure expertise.

UBS appears fifth on the list of algorithmic trading solution providers by responses (35). Thirty-one percent of long-only funds turning to UBS for algorithmic trading expertise execute 50% or more of their portfolio value algorithmically. Nearly half (47%) of UBS' clients participating in the survey this year have US$50 billion or more in AUM. The company has an average ranking of 5.46 (-0.25 below the survey average), which is 11th relative to other algo providers and represents a 0.30 decline versus last year's average score. While UBS is relatively flat year-over-year in the cost category, this year's results yield declines in every other area, the most significant being anonymity, which has decreased by 0.52 from 12 months ago.

UBS RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
5.64	5.46	5.73	5.65	5.48	5.46	5.35	5.45

Ease of use	Data on venue/order routing logic or analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of smart order routing	Algo monitoring capabilities
5.67	5.43	5.47	5.15	5.52	5.38	5.13

KEY STATS

5.73
Highest score
(execution consistency)

5.13
Lowest score
(algo monitoring capabilities)

0.00
Most improved
(n/a)

-0.52
Least improved
(anonymity)

Virtu ITG

Virtu Financial (Virtu) is a New York-headquartered provider of financial services, trading products, and market-making. Virtu's recent combination with ITG creates a complete suite of client solutions, including execution services, workflow technology, liquidity sourcing, and trading analytics. Virtu provides a global suite of algorithms for single-stock, portfolio, and pairs trading as well as an event-driven routing model and dark pool aggregation for access to dark liquidity via nondisplayed destinations.

Virtu ranks sixth in temrs of responses (35) by long-only funds choosing algo providers. Half of these firms manage US$50 billion or more, and 54% trade at least half of the value of their portfolio algorithmically. The company has an average ranking of 5.63, which marks an improvement of 0.05 versus last year and places it in 10th place by peer rankings in this year's survey. Virtu's scores have improved in nine categories over the past 12 months. The greatest increases in scores are observed in flexibility and sophistication of smart order routing (0.30), anonymity (0.29), data on venue/order routing logic or analysis (0.26), and customisation (0.20). Increased trader productivity and algo monitoring capabilities both show notable year-over-year declines of 0.31 and 0.26, respectively.

VIRTU RATINGS FOR ALGORITHMIC PERFORMANCE

Increased trader productivity	Reduced market impact	Execution consistency	Cost	Speed	Anonymity	Price improvement	Customisation
5.70	5.74	5.67	5.62	5.76	5.83	5.55	5.30

Ease of use	Data on venue/order routing logic or analysis	Customer support	Execution consulting	Dark pool access	Flexibility and sophistication of smart order routing	Algo monitoring capabilities
5.74	5.58	5.66	5.30	5.96	5.67	5.41

KEY STATS

5.96
Highest score
(dark pool access)

5.30
Lowest score
(customisation)

0.30
Most improved
(Flexibility/ sophistication of SOR)

-0.31
Least improved
(increase trader productivity)