Hedge funds are all about making money. And once they start making money, they like to make more. Increasingly, hedge fund managers are turning to technology to bolster returns, particularly in the area of trading. The integration of direct market access, order management systems and automated trading algorithms has given hedge funds more power to manage their own orders, a higher degree of anonymity and a cost advantage, to boot. But the shift of power from the sell side to the buy side has left brokers scrambling to create ever more useful trading tools in an attempt to hold on to their execution business.

Trading algorithms — mathematical formulas that direct the automated trading of an individual stock or basket of stocks based on preset goals or parameters — are among the newest of these tools. They allow hedge funds to improve the quality of their trades and to free up human traders so they can focus on more-difficult transactions. They offer an additional advantage as well: Algorithmic trading can cost less than a penny a share, compared with as much as 5 cents a share for a full-service, human-executed transaction.

“Algorithms are the wave of the future,” says Nhan Bui, head trader at First Quadrant, a $25 billion investment manager based in Pasadena, California, that runs about $1 billion in hedge fund money. “I have greater control over my orders with algorithms.”

The dramatic expansion of the hedge fund industry — Westborough, Massachusetts–based research firm TABB Group estimates that worldwide hedge fund assets under management will surpass $2 trillion by 2008 — has left managers searching harder than ever for sources

By Pam Abramowitz

Photos by Jordan Hollender for Alpha

Algorithmic Trading

of alpha. As more hedge funds are using the same strategies, investment returns are being squeezed, and many managers are turning to algorithms.


Typically, algorithms execute buy or sell orders of a defined quality using a quantitative model that automatically generates the timing and size of the orders. Some algorithms attempt to replicate the results of a specified benchmark. The first, and most widely known, benchmarked algorithm is the volume-weighted average price, or VWAP, which seeks to execute the trade at or below the price at which the majority of a given day’s trading in a stock takes place. Other algorithms are not tied to a specific price goal; rather, they fulfill specific parameters on when or where to execute trades.

Traders use algorithms to slice and dice orders so as to minimize market impact. For example, instead of placing a buy order for 500,000 shares all at once, an algorithm could send out 500-share orders to different markets every five minutes, executing the purchase over the course of the day. Market impact would be dramatically reduced, the source of the buy orders would be unknown, and the cost would be lower than it would have been if the trade were executed by a broker’s sales trader. The time frame, how passively or aggressively the order is pushed through, and the liquidity and volatility of the stock all factor into the decision of which algorithm to use.

“Algorithms make traders more efficient,” says Robert Kissell, vice president of global execution services at J.P. Morgan Chase & Co. in New York. They are a natural choice for routine orders.

First Quadrant’s Bui agrees. “I like algorithms because they free up my time to focus on more-illiquid, high-touch trades,” she says. “They let me be more efficient and save money, and I don’t need as many traders.” First Quadrant, which has just two traders managing $7 billion in equities, will be increasing its use of algorithms from less than 50 percent of trades currently to as much as 70 percent.

Algorithms have been growing in popularity among investors of all stripes, but they’ve been in especially high demand among hedge funds. Instinet’s Plunkett estimates that 70 percent of all algorithmic trading is conducted by hedge funds. “People are using these tools and want to use them more and more,” says David Quinnan, president of Boston-based Eze Castle Software, a provider of trade order management systems to both hedge funds and traditional money managers. His firm has integrated algorithms from 22 different brokers into its Traders Console software.

Major securities firms, such as Banc of America Securities; Citigroup; Credit Suisse; Deutsche Bank; Goldman, Sachs & Co.; J.P. Morgan; Lehman Brothers; Merrill Lynch & Co.; Morgan Stanley; and UBS, have created suites of electronic trading products, including algorithms and programs that can estimate and analyze the actual costs of using them. Specialized agency brokerage firms, such as Instinet and New York–based Investment Technology Group, also offer a wide range of products. “You need lots of flavors to appeal to lots of clients,” says Plunkett, 43, who joined Instinet in 1991 as a sales trader.

Instinet has 12 different algorithms, including traditional VWAP, time-weighted average price, or TWAP, and volume participation, which minimizes market impact by restricting trades to a certain percentage of a stock’s daily trading volume. ITG’s 14 algorithms include three that seek hidden liquidity in “dark books”: alternative trading systems like its own Posit crossing network that match buy and sell orders without publishing quotes.

Among the big brokers, Goldman Sachs offers algorithms through its RediPlus electronic trading platform — everything from VWAP and TWAP to newer “implementation shortfall” algorithms that attempt to minimize the difference between the executed price of a trade and the price of the stock at the time the order is placed. Other algorithms shift strategy based on changing market conditions during the day. Goldman even has a product that automatically selects the best algorithm for a particular trade for traders who don’t know which to choose.

Brokers are offering increased customization as they try to differentiate their products from one another. J.P. Morgan gives clients a choice of ways to adapt to changing market conditions: aggressive in-the-money algorithms that drive shares faster as prices become more favorable to lock in the better prices, and passive in-the-money algorithms that transact more slowly in times of favorable prices to realize even better prices if the trend persists.

Stealth algorithms, which attempt to keep traders’ activities below the radar, are gaining in popularity. These include Instinet’s Cobra and J.P. Morgan’s Aqua, for liquid stocks, and Arid, for illiquid ones. “They look at the history of quotes and size and take parts of current offers across a handful of markets, not whole offers, so the market doesn’t move,” Plunkett explains.

New smart order-routing algorithms take advantage of the Regulation NMS requirement that all markets must meet the best bid and offer. These algorithms split orders among many marketplaces to give users an advantage, says Joseph Wald, CEO of New York–based EdgeTrade, an agency-only broker that provides direct market access and algorithmic trading products. EdgeTrade launched a smart order routing product called Sumo last fall.

To address the issue of market fragmentation, brokers

“Most algorithms are only marginally different because they’re all based on mathematical equations.”
— NHAN BUI, HEAD TRADER, FIRST QUADRANT
have created products that seek to aggregate liquidity pools both within and without their firms. They are also developing new types of algorithms to trade portfolios and multi-asset classes, as well as moving into areas such as currencies, foreign exchange, futures and derivatives.

With all these choices, deciding which algorithm to use can be daunting. The avalanche of new algorithms and parameters by which hedge funds can change them risks leaving traders feeling overwhelmed or marginalized. “Everybody has algorithms now, but brokers need to educate the buy side about how to use them,” says First Quadrant’s Bui.

The development of these technologies could be the difference between success and failure in the brokerage community. Nearly half of all hedge funds recently surveyed by TABB Group are considering a change to their roster of prime brokers, especially if some of those brokers don’t have the right suite of tools, says Matthew Simon, analyst and co-author of a recent study, “Hedge Funds 2006: The Quest for Alpha in a Competitive World.” Two thirds of the funds surveyed by TABB are planning to expand into new investment strategies in the next two years, and that will make them rely more heavily on prime broker services such as algorithms.

The plethora of firms offering algorithms based on the same benchmarks has led to some criticism within the hedge fund community that the tools are becoming commoditized. “Most algorithms are only marginally different because they’re all based on mathematical equations,” says First Quadrant’s Bui. In other words, mathematically based programs that have the same goal will follow the identical or very similar steps to get to that goal. So whether a hedge fund uses Goldman’s, Morgan Stanley’s or EdgeTrade’s VWAP algorithm, the result will theoretically be the same.

“There is a consistent chorus of ‘they’re all the same’ among buy-siders,” says Eze Castle’s Quinlan. “At some point there’s overkill — a given trader doesn’t need seven different flavors of VWAP.”

TABB Group’s Simon points to a recent study that shows a decline in the use of VWAP, from 61 percent of all algorithms in the second quarter of 2004 to 16 percent in the second quarter of 2006. “It’s becoming yesterday’s trend,” he says.

The increased complexity of algorithms demands the use of transaction-cost-analysis tools, both pretrade and posttrade, to minimize trading costs while accurately reviewing the algorithm’s — and thereby the broker’s — performance. Ultimately, such tools can help a trader determine which broker and system will lead to best performance, and brokers are rushing to provide them.


“Over the past year we have received a large increase in requests for more-sophisticated pretrade tools,” says Jana Hale, global head of algorithmic trading at Goldman Sachs. “They stem from the client’s need to better understand the costs and benefits of using various algorithmic and trading strategies, but also from the need to navigate the prospective confusion emerging from the large variety of offerings recently pushed out by the sell side.”

Goldman Sachs has focused on client education. “We spend a lot of time consulting with clients on how best to use algorithms,” says Greg Tusar, head of U.S. electronic trading. Users need to understand how a given algorithm will work based on historical data, he explains, but they must also be wary of periods of unusual volume or behavior, when algorithms may not perform as they have in the past.

J.P. Morgan offers clients a pretrade cost estimator that forecasts a trade’s market impact and allows the trader to change algorithms or its parameters at any time dur-
Algorithmic Trading

based commission budget. TAL is a subsidiary of Toronto-based CIBC Asset Management, which manages C$60 billion ($54.6 billion) in assets, including index funds and hedge funds.

Most hedge fund managers are opting to buy rather than build algorithmic trading systems. Constructing these products from scratch is more expensive and riskier than buying off-the-shelf products, according to the TABB Group study. Algorithms incur high start-up costs, not just for the infrastructure required to handle the massive amounts of tick data, but also for research, engineering and on-going maintenance costs. “We are constantly investing in the financial engineering behind our algorithms because volumes, volatility and market structures are changing,” says Goldman’s Tusar.

Still, hedge funds have some reservations about using algorithms. “I question whether there are two levels — the level that gets sold to clients and a level that stays in-house,” says one New York–based multistrategy hedge fund manager, whose firm has been able to cut down on the number of traders it employs by ramping up its use of algorithms. “It’s an expensive process to create your own, so you just have to assume you’re going to lose some transaction costs when using algorithms created by the sell side.” For now, however, there’s no evidence of such a double standard. “The algorithms we offer clients are exactly the same as the ones we use internally,” insists Tusar.

Some traders, meanwhile, are concerned about how brokerage firms that have large proprietary trading operations may use the information generated by algorithmic trading systems. “The wall isn’t as high or as thick as it should be,” says First Quadrant’s Bui. “I prefer to trade with a nonproprietary desk because of the potential conflict of interest.”

J.P. Morgan’s Kissell says such worries are ill-founded. “Our prop desk is on a different floor than trading,” he notes. “They have no access to any agency flow or client order flow. And this isn’t just a J.P. Morgan feature, it’s every broker’s franchise, and you’d never do anything to harm the franchise.”

Algorithmic trading is here to stay. For hedge funds, the benefits — lower cost, better execution, greater control and anonymity — far outweigh the concerns. As for the brokers, they will continue to battle, striving to be the fastest at bringing the most-sophisticated tools to market and to teach their clients how to use them. The highly competitive world of Wall Street and the never-ending search for alpha require it.

“It’s basically an arms race,” says Instinet’s Plunkett. “If you take a week off, you’ll fall behind.”