ALGO WARS

BY JOSH FRIEDLANDER

Algorithmic execution is the toast of Wall Street trading–and its last, best hope. Driven by market developments and tougher regulations that make trading equities more complicated and less profitable, the Street is pushing algorithmic trade execution with a vengeance, offering the service as a means to retain historically cozy relationships with their institutional and hedge fund clients.

Algorithmic trading is not a new concept, but its proliferation on Wall Street in recent years has been staggering. Simply put, algorithmic trading automatically generates the size and timing of orders based on preset parameters (see sidebar on p. 34 for complete definition). While some algorithms are simple tools, others are growing so sophisticated that they soon may function more like R2D2, the super-intelligent robot of Star Wars fame.

> ## The Street is pushing algorithmic trading with a vengeance–perhaps even into small caps

Because the democratization of algorithmic trading has just begun, its impact on the corporate world is still uncertain. Algorithmic trading is now predominantly used to trade large-capitalization companies, by making it easier to buy and sell large blocks of stock. But it is less well suited as a means to trade small-cap, less liquid stocks–or so many think. The growing use of algorithmic trading could lead brokers to further ignore the small-cap universe. That would be another hit to the fortunes of small companies, already at odds with the public markets due to diminished stock research coverage and increased regulatory costs.

But algorithms could also mean small-cap salvation. Rob Flatley, head of electronic trading services at Banc of America Securities, says his division is using algorithms to gauge BofA's risk better when making markets in small

cap stocks, hence increasing its willingness to do so. If the Street moves in this direction, there is the potential for a meaningful increase in small-cap liquidity.

Helping make more liquid markets for small-cap stocks is hardly a driver for the current frenzy, however. "It would be harder to find a hotter topic in capital markets than algorithmic trading," says BofA's Flatley. Like most rapid advances, the speedy implementation of algorithmic trading has been driven by necessity.

The trading game has changed dramatically in the past five or so years. A broker can no longer ply his trade, so to speak, without using electronic execution, of which algorithmic trading is a growing component. And while algorithmic trading is not likely to replace traders, many agree, it does raise a distinction between the old world of men in pits screaming orders and that of quiet trading floors humming with the monotonous sound of computer fans and spinning hard drives. "Remember when chess grandmaster Gary Kasparov was playing against [IBM supercomputer] Deep Blue?" adds Flatley. "There's a certain man-versus-machine quality to this, too."

Fractured markets

The result of tectonic shifts on Wall Street, algorithmic trading is another method the traditional brokerage firms have grasped to maintain their advantage as the go-to guys for trading, while smaller upstarts see algorithms as a way to level the playing field and infringe on the brokers' traditional turf.

Algorithmic trading is in vogue because the proliferation of new markets and of new players in the brokerage industry has created a hostile environment for traditional bulge-bracket brokerage operations. While the Nasdaq and other electronic exchanges had threatened the collegial open outcry model of the New York Stock Exchange and of phone-based order flow, the big earthquake to hit trading occurred in 2001. That's when the Securities and Exchange Commission imposed decimalization. That mandate forced the Street to switch from valuing stocks in sixteenths ($.0625) to valuing them in penny spreads ($.01). The result was an increase from six price points for every dollar to 100. Taken another way, that's equivalent to an 84% reduction in trading margins. This tightening of spreads cut a lot of fat out of the market, hurting the profitability of the brokers. The diminished profitability was compounded by the proliferation of electronic trading networks and peer-to-peer trading systems. While those have served a valuable purpose, they've also led to the fragmentation of liquidity across

the markets by moving buy and sell orders away from a few central trading floors to a bunch of separate venues.

Bulge-bracket firms, which had been using algorithmic trading internally on their proprietary trading desks for years, thought to harness those systems for use in executing client orders. This was an act born of necessity more than altruism, and not necessarily an act of magic, either, despite much of the hype.

"It's not what it seems. It's not the super-duper electronic trading service that's going to solve your problem," says Sang Lee, co-founder and managing partner at consultancy Aite Group, which in March published a white paper titled "Algorithmic Trading: Hype or Reality."

"The right perspective would be to consider algorithmic trading as one of many execution options that people have at this point," says Lee. "Beyond that, I don't think it's that sig-

nificant. It emerged from this hostile institutional trading environment where it's getting increasingly difficult to move large blocks of orders."

Algorithmic trading has proved to be an obvious solution for the problem of smaller spreads and market fragmentation. It makes far more sense to tell a computer, "buy me 100,000 shares of a stock," than to have a human trader execute that order when doing so might require monitoring multiple markets with a variety of different bid/ask spreads, making sure to get the best price in each one on numerous tiny orders.

"They were dealing with changing market structure issues," notes Lee. "For them to trade 100,000 shares or one million shares of a stock was getting incredibly difficult and time consuming. They created these algorithms so that they could slice and dice and send these orders to the marketplace without even thinking about it."

As a result, algorithmic trading now accounts for 25% of all equities trading volume, says Lee. A 2004 study by the Tabb Group, another consultancy, found that 61% of buy-side firms (and 82% of the large ones) have used algorithmic strategies and estimated that usage would increase 150% annually from 2004 to 2006. The bulge-bracket brokers, fronting 63% of all algorithmic trades, are largely driving this growth, Aite Group estimates.

Much has been made of all the niche players in the algorithmic market, and they seem to be a healthy diversifier but not a serious threat to Wall Street's trading dominance, if only because the better ones are likely to be bought. "There are always niche players, and I'm sure some will

rithmic trades than for other forms of execution. Though Wall Street firms hesitate to say it, algorithmic trading is more than just a tool that allows any given trader to do his job better. It also allows that trader to do more work, meaning ultimately that there will be fewer traders–though probably never the apocalypse that is continually predicted.

"Algorithms are not a replacement for traders," says Jana Hale, global head of Goldman Sachs's algorithmic trading. "They are one of the tools in your toolkit that makes you better, smarter. The algorithms are only as good as the people who design and use them."

Of course, the traders who do use them well will theoretically replace a larger number of traders who don't. "The push internally is largely driven by the efficiency gains that we get from a trader being able to handle more flow," says Will Geyer, head of alternative execution at Citigroup. By efficiency, he means fewer traders handling more order flow.

"We finally have taken a look at that big cost item that's been sitting in front of the trading screen for all these years," notes George Rodriguez, managing director at Algorithm Trading Solutions, an institutional broker/dealer that provides clients with algorithmically driven order placement and execution.

The players

Algorithm Trading Solutions parses the world of algorithmic trading into four groups. There are "legacy" sell-side firms, as it calls them, direct market/order management system vendors, algorithm aggregators that provide access to numerous providers through a central-

BofA's Flatley:

'Remember when Gary Kasparov was playing against Deep Blue? There's a certain man-versus-machine quality to this, too.'

continue to survive," says Dave Cushing, head of the execution services analytics group at Lehman Brothers. "I'm sure many will also fall by the wayside or be acquired."

Observers believe this flux in the market will continue for another two years or so before being sorted out. One certainty may be the continuance of steadily decreasing fees for trade execution, which are significantly less for algo-

ized order processing and clearing system, and agency broker dealers, of which they are one.

Brokerage firms (the sell side) developed their algorithms in-house and are now offering these both to clients and to smaller firms to white label (to offer ostensibly as their own). What that means, ATS posits, is that algorithms that the sell side offers could be overused and thereby become

less effective. Sell-side players counter that they are constantly innovating and customizing their algorithms.

The second group–the direct market and order management companies–already have pipelines to the buy side, so adding algorithms was obvious for them. Many of these also offer the algorithms of the sell-side firms, raising the aforesaid issues. Indeed, for the sell side, getting distribution of

tomized algorithms," agrees Aite Group's Lee. "The sell side is taking a consultative approach to get new clients. The first wave of early adopters is done. Most of the brokers we've spoken with are trying to get to the next layer of buy-side clients."

BofA, Credit Suisse First Boston, Goldman Sachs and Lehman Brothers all say they are seeing increased demand
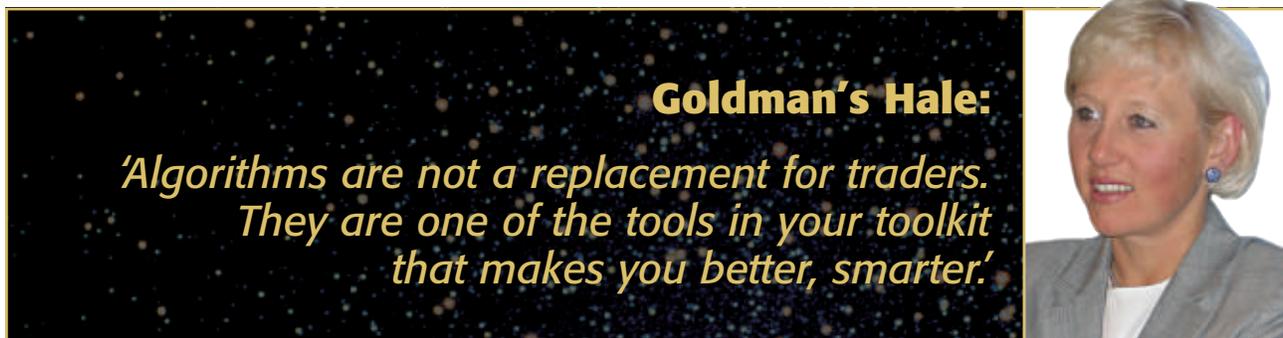
Goldman's Hale:

'Algorithms are not a replacement for traders. They are one of the tools in your toolkit that makes you better, smarter.'

their services via order management system vendors has been a time-intensive but worthwhile hassle, they say, because the order management vendors have already staked claims to the "desktop real estate" of buy-side traders.

Finally, aggregators, of which there are few, tout additional anonymity (an added layer between the order and the execution point) and variety. But ATS argues that aggregators may actually betray anonymity by leaving open the potential for additional information leakage, a recurring boogeyman for order flow of any kind.

On that last point, Scott Kurland, head of business development at Electronic Specialist LLC (ESP), a leading aggregator, says there are so many different types of order flow going down through ESP's network "that it would be difficult for any one provider to game volume from a specific customer."

ATS argues that agency brokerage, especially its own brand–wherein the algorithms are designed in-house, not the case with all agency brokers–is the best model. These algorithms are not used by the firm's proprietary trading desk, because there is no prop desk, and the firm takes the time to explain the value of their products to clients. Of course, sell-side firms also tout the educational and customer service aspects of their offerings. ATS is obviously self-interested, but its objections to competing models could hurt the competition if buy-side clients feel similarly.

Customizing the algo

The exclusivity of algorithms, in particular, is poised to become a bigger issue. "You're gonna see a lot more cus-

for customized algorithms that can better complement portfolio managers' trading styles. They all charge a little extra for the service, though none is willing to talk about fees.

"We choose to offer customers a core set of algorithms with a ton of flexibility. We offer customers the ability to create their own stylized versions," says Citigroup's Geyer. The firm's offering includes a small number of highly customizable algorithms versus a larger number of distinctly different strategies. The firm's best execution consulting services group helps clients with customization by studying their historic execution data and generating forecasts of how their trading style is likely to perform in various circumstances. Several firms have similar offerings, and the historic analysis goes both ways.

"We do allow clients of ours to have a glimpse into performance data on each and every trade through our pretrade analytic product by looking back on very similar trades to the one the client is entering," says Daniel Mathisson, CSFB's global head of Advanced Execution Services. CSFB says it has completed more than 30 customized algorithms for clients to date in the four years the firm has offered algorithmic trading to clients, including 15 in the past year, confirming an increase in demand.

Customization, while appealing to clients, is likely to further complicate the buy side's ability to make objective selections of the best algorithms, if such distinctions are even truly possible. The problem with customized algorithms and with the firms' off-the-shelf offerings is that

measuring the success of any given algorithm is probably a fool's errand. There are five basic algorithms in wide use, which measure the success of a trade based on volume weighted average price (VWAP), time slicing, implementation shortfall, volume participation, and smart routing methods.

Each of these is useful in certain circumstances, but measuring their effectiveness even within "favorable" conditions would be difficult to accomplish with a high degree of certainty. "The technology to measure how good these algorithms are has not been fully formalized," says Larry Tabb, founder and CEO of the Tabb Group.

Some would disagree. "You can judge them objectively over repeated trials," says CSFB's Mathisson. Or, as Goldman's Hale puts it, if a firm is consistently beating or falling behind its own pretrade estimates, something might be amiss.

"A good algorithm can be used badly any day of the week," says Lehman's Cushing. "The challenge is to educate our clients to make better use of algorithms."

In the future, the buy side may get a better handle on which firms offer the best algorithms for particular strategies, but even so, elements like customer relations and overall service are likely to complicate the issue of selection.

"If you have the choice of only being able to get the execution from your vendor or the execution plus the potential access to other services, what would you choose?" asks Goldman's Hale. Obviously, clients won't continue using a bulge-bracket firm for algorithmic trading if they stink at it, she notes, but if that firm's algorithmic offering is comparable to those of independent

new asset classes are thrown into the mix. Algorithmic trading is equities-centric for the time being, but firms are pushing to provide more variety, which will allow their clients–hedge funds, especially–to execute complicated multi-asset strategies algorithmically.

"We're starting to see sell-side firms design multi-asset-class algorithms," says ESP's Kurland. These could include the fixed-income, futures, options and foreign exchange markets. Goldman Sachs currently offers three algorithms for the futures markets and is planning to roll out another two in the near future, says Hale. The firm has no plans to add options algorithms. "We haven't heard a screaming need from the clients yet, but it may come," she says.

The small-cap dilemma

Even as firms offer clients the advantages of algorithmic trading in a variety of new markets, one area of equities may or may not be tapped: small-cap stocks.

As to whether algorithms can work effectively trading illiquid stocks, there are currently more naysayers than cheerleaders. "I think it's going to be hard. The idea of creating liquidity is interesting, but I think it's more difficult to do than it sounds," says ESP's Kurland.

But there is hope. One method that BofA is using involves the posting of bid/offer spreads for 1,600 stocks–the Russell 1000 index plus an additional 600 small and midcap names–to a Web site that updates every four seconds. BofA bases its bid/offer on pretrade assessments of how well its algorithms are likely to buy or sell these stocks once the firm commits to put its cap-

Lehman's Cushing:

'A good algorithm can be used badly any day of the week. The challenge is to educate our clients to make better use of algorithms.'

vendors, the added goodies in a bundled relationship might influence a decision. "When larger broker/dealers offer this functionality, and you can use those commission dollars to have access to multiple products and resources, it seems odd that there would be so many outside providers," she adds.

The game is likely to get only more complicated once

ital to use for its clients.

If the firm beats the projected spread, it will share any difference with the client up to one cent per share. "The evolution of algorithmic trading coupled with the change in the workflow practices of people–eliminating user bias–over time will allow people to use algorithms on an even distribution across large, mid and small-cap stocks,"

The Many Faces of Electronic Trading

Part of the difficulty faced by those offering algorithmic trading services is the buy side's confusion over or ignorance of the subject. Quite often the terms "program trading," "algorithmic trading," and "black-box trading" are misunderstood or used interchangeably. Here is a brief glossary with commentary:

Algorithmic Trading

In its online glossary, the Tower Group, a Needham, Mass.-based consultancy, defines algorithmic trading as "placing a buy or sell order of a defined quantity into a quantitative model that automatically generates the timing of orders and the size of orders based on goals specified by the parameters and constraints of the algorithm."

The term was not always defined that way. Sang Lee, co-founder and managing partner of Aite Group, a consulting firm, notes that when he left his previous post at Celent Communications in June of 2004, algorithmic trading as a term was used interchangeably with quantitative trading. By the time he had begun his work at Aite, he said, the term had come to define only the execution of trades, but not the divining of trading opportunities.

The term is imprecise and ambiguous. Any trader following a set protocol could be said to have an algorithmic strategy. An "algorithm," broadly speaking, is any predefined step-by-step method used to accomplish a task.

The term is derived from the surname of famed mathematician Abu Abdullah Muhammad ibn Musa al-Khwarizmi, who lived from around 780 to 850 AD and who introduced the concept of algorithms and of algebra into European mathematics, among numerous achievements. The picture bearing his likeness at right is from a stamp commissioned by the Soviet Union in 1983 on what is thought to be roughly the 1,200th anniversary of al-Khwarizmi's birth.

The near-universal application of the term "algorithm" is likely to continue frustrating those who would distinguish between various computer-based trading procedures, as all involve algorithms to some degree. Quantitative strategies by their very nature employ algorithms to search the market for trading opportunities. "Algorithmic trade execution" might be a more precise term for what is now called algorithmic trading, but it appears that the market has already spoken.

Program Trading

Program trading, as defined by the New York Stock Exchange, "encompasses a wide range of portfolio-trading strategies involving the purchase or sale of a basket of at least 15 stocks with a total value of $1 million or more."

As of March 2002, program trading made up only 25% of all NYSE volume, notes the Tabb Group. It swelled to reach a peak of 70% on June 21, 2004, but has retreated a bit since. The NYSE, in a May 12 report, said that program trading had, from May 2 through May 6, amounted to 56.5% of the exchange's average daily volume of 1,644.6 million shares. Program trading by member firms across all markets averaged 1,538.0 million shares per day during that same period, the NYSE reported.

The most active firms in program trading on the NYSE during that period were UBS Securities and Lehman Brothers, "executing most of their program trading as principal for their own accounts," the NYSE said. Goldman Sachs and Morgan Stanley "executed most of their program trading activity for customers, as agent. Credit Suisse First Boston split its activity between its own accounts and those of its customers."

Black-Box Trading

"Black box" is a metaphor for any opaque system that takes input and gives output (such as buy and sell orders), while the system's inner workings remain secret to all but its creators. It has rapidly become the term du jour for any sophisticated trading enterprise based on an electronic set of rules, though that definition is imprecise.

In practice, when Wall Street denizens discuss

"black-box trading," they tend to mean trades executed at the behest of a computer that has taken in certain market data and essentially carried out the job of a portfolio manager by deciding, based on the input, which stocks to buy and sell, and typically when and how much.

In some cases, the box may be free to send its order for execution without any human intervention. In others, someone will supervise the box's outputs and decide if the box is making a wise decision or, alternatively, woke up this morning on the wrong side of the server.

Several hedge funds use black boxes frequently, and they have usually back-tested the outputs of these systems against typical and atypical market conditions to see, for instance, whether their box would have made or lost them money in the 1987 crash or during the Russian debt default crises in the summer of 1998 that infamously unraveled hedge fund Long Term Capital Management that fall.

In the Black?

Since algorithmic trading systems are used to execute pre-existing decisions to buy or sell, simply using an algorithm to trade does not mean that one is engaged in black-box trading. And algorithmic trading systems are not typically referred to as black-box systems.

Technically speaking, though, algorithmic trading systems often evince black-box qualities, as they do indeed monitor markets to decide when, where and how much of an order to execute.

Confused? It gets better. The most sophisticated algorithmic trading systems are beginning to blur the lines between strict order decisions (picking what to buy or sell) and order implementation (deciding how best to buy or sell). If, during the execution of an order, an algorithm is smart enough in reading the market to make more money than a pretrade analysis had indicated, one might not be remiss in saying that the algorithm executed a partial black-box strategy.

—Josh Friedlander

The White Paper Blizzard

Nothing attracts consultants quite like a complicated and esoteric market that features numerous competitors with complicated interrelationships, a variety of product offerings, and an uncertain future. It has been no surprise, then, to see the usual suspects embrace algorithmic trading. Some papers that feature algo trading recently include:

Consultancy	Report Title	Released
Aite Group	*Algorithmic Trading Technology: Profiling the Leading Vendors*	April 2005
Aite Group	*Bulge Bracket Firms & Algorithmic Trading: A Brave New World*	April 2005
Aite Group	*Algorithmic Trading: Hype or Reality*	March 2005
Celent Communications	*Algorithmic Trading Update 2005: Advanced Execution Goes Mainstream*	May 2005
Financial Insights	*Marching Up the Learning Curve: The First Buy-Side Algorithmic Trading Survey*	May 2005
The Tabb Group	*Institutional Equity Trading in America 2005: A Buy-Side Perspective*	May 2005
The Tabb Group	*Data: The Life Blood of the New Electronic Marketplace*	April 2005
The Tower Group	*Providers of Algorithmic Trading Solutions: Qualifying and Quantifying Market Participants*	September 2004

Algorithm Trading Solutions' Rodriguez:

'We finally have taken a look at that big cost item that's been sitting in front of the trading screen for all these years.'

says BofA's Flatley.

"[Sell-side firms] can mitigate risk by using an algorithm to determine when they can commit capital. In the simplest of senses, yes, that can be done," says ESP's Kurland. "In theory, it should create more liquidity than would exist just on an exchange or ECN. I haven't seen that proliferation in the market, but I believe it's something under development by a number of firms."

Still, cautious optimism appears to be the majority view for now. "The smaller the capitalization, the more illiquid, the more careful you have to be about applying algorithms to a given trade," says Lehman's Cushing. It would be easier for others to detect the use of algorithms in small-cap stocks, he notes, and liquidity in the small-cap space is more episodic. In small caps, he says, a trader still may need to get on the phone to find a buyer or seller based on who has been trading or who is likely to. "There's more value-added to a traditional trading process in a small-cap name," he says.

"Algorithms are often more suitable for large-cap, liquid stocks, where in the small-cap universe, there's still quite a bit of value that people can add to the process," adds Citigroup's Geyer.

But Frederick Graboyes, president of Algorithm Trading Solutions, says the view that algorithmic trading is only suitable for large, liquid issues is just a myth. Successfully trading small-cap stocks may simply require more sophisticated algorithms. Another myth, notes Graboyes, is that algorithms are easy to develop.

With algorithmic trading still in its infancy, many myths will no doubt be shattered over time as Wall Street and its rivals look to differentiate themselves. The ultimate beneficiaries of this competitive maelstrom will likely include buy-side firms, for whom the competition among different practitioners can only yield profit. Perhaps–with the right execution–even small-cap stocks will reap rewards from the algorithm's rapid advance down Wall Street. **IDD**