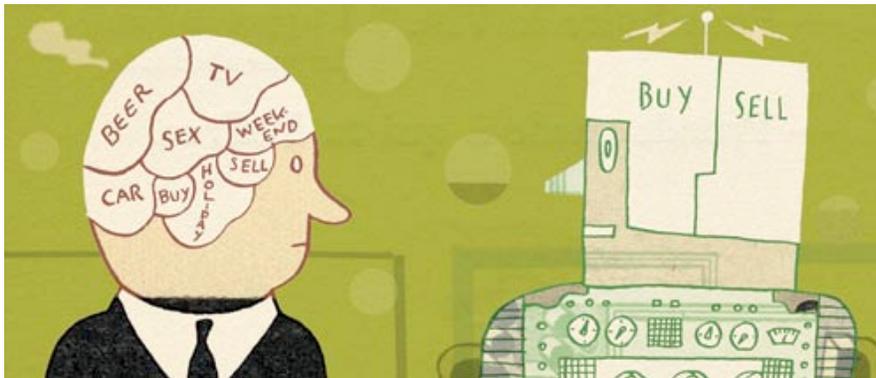


REPORTS

The march of the robo-traders

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Software: Programs that buy and sell shares are becoming ever more sophisticated. Might they replace human traders?

IMAGINE the software equivalent of a golden goose: a program that continually produces money as its output. It sounds fanciful, but such software exists. Indeed, if you have a pension or endowment policy, or have money invested in share-based funds, the chances are that such a program—variously known as an “autonomous trading agent”, “algorithmic trading” system or simply as a “robo-trader”—has already been used to help your investments grow.

Simple software-based traders have been around for many years, but they are now becoming far more sophisticated, and make trades worth tens of billions of dollars, euros and pounds every day. They are proving so successful that in the equity markets, where they are used to buy and sell shares, they already appear to be outperforming their human counterparts, and it now seems likely that their success will be repeated in foreign-exchange markets too. Proponents of robo-traders claim that, as well as making more money, they can also help to make markets more stable. And, of course, being made of software, they do not demand lunch breaks, holidays or bonuses.

This has prompted an arms race as companies compete to develop the best sets of rules, or algorithms, to govern the behaviour of their robo-traders. “We live and die by how well they perform,” says Richard Balarkas, global head of advanced execution services at Credit Suisse First Boston, an investment bank. The better the technology, the more money it makes for the client, he says.

At the moment, big strategic decisions, such as deciding which shares to buy and sell, are still made by experienced human traders, says David Cliff, who is the director of Deutsche Bank's Complex Risk Group in London and a veteran of the field. Robo-traders are then given the power to decide how to buy or sell shares, always with the aim of hiding their client's intentions. If you are a pension-fund manager and have decided to sell a million shares in some company, merely revealing your intention to sell will result in the market moving

against you, even with very actively traded shares, notes Dr Cliff. So the aim of the game is to try to unload the shares in such a way that no one notices what you are doing.

Buy! Sell! Exterminate!

The simplest algorithmic-trading systems might try to drip-feed the market by slicing up a big trade into a hundred smaller orders. By introducing these trades slowly into the market over some predetermined period of time—a few minutes, or hours, or days—the idea is that the smaller orders are less noticeable, and so have a less dramatic effect on the market price. But such “salami slicers” would not win any prizes these days, says Dr Cliff. Today's more advanced robo-trading programs can cover their tracks more adeptly, for example, by varying the amount they sell, and sometimes even buying back the very stock they are trying to get rid of, he says.

Some firms, such as FlexTrade of Great Neck, New York, now offer complete algorithmic-trading platforms. These allow clients, be they investment banks or hedge funds, to straddle different markets seamlessly and use built-in but customisable trading rules to do their buying and selling. The advantage is that the clients get to use algorithmic trading without all the hassles that come with it, such as having to connect to particular exchanges, check data feeds are live or deal with the sending out of orders that have been placed; the platform does all of those things automatically. But while these kinds of platforms are likely to increase the prevalence of algorithmic trading, those in the business regard them as rather primitive when compared with more sophisticated, proprietary systems.

Robo-traders' main advantage is speed, says Marcus Hooper, a specialist in global electronic-trading solutions for Bear Stearns International in London. In many electronic markets the time delay, or latency, associated with making a trade can be quite significant—in some cases several seconds. This is a major headache for traders. “By the time their fingers hit the keyboard, someone else could have beaten them to it,” says Mr Hooper. So any algorithm that can respond faster than human traders has a definite edge, he says.

Another advantage stems from the basic limits that exist on how much information human traders can realistically absorb. Studies have shown that professionals make their trading decisions only after considering three or four variables, says Mr Balarkas. Computers, on the other hand, can take in hundreds of variables simultaneously, and refer back to a wealth of historical data, in the blink of an eye. In 2001 Jeffrey Kephart, a researcher at IBM, compared the performance of human commodity traders with autonomous trading agents. He found that the software agents, which included one developed by Dr Cliff (who at the time was a researcher for Hewlett-Packard in Bristol), produced 7% higher returns than humans.

So is this the end of human traders? Far from it, says Mr Balarkas. Instead, man and machine work best together. “Algorithms are not the financial-market equivalent of an unmanned droid—they need a trader to operate them, just like a Formula 1 car needs a driver,” he says. This requires judgment, something computers have yet to master. Algorithmic trading is emerging as an important new tool, but human traders will only use it when appropriate.

For instance, although the latest trading algorithms can be pretty sophisticated, a lot of them are based on what are called volume-weighted average-price models. These models set buying or selling prices based on what is calculated to be the average price for a given day—in other words, they use a low-risk, follow-the-herd approach. This has its uses: it can, for example, be useful to unload a large number of shares far more quickly than might be practical manually.

“Eventually, robo-traders may be capable of analysing news feeds, deciding which shares to buy and sell, and devising their own strategies.”

The human touch

But to make the real money, human traders rely upon riskier strategies that enable them to outdo their competitors. This requires more than just experience, market knowledge and the ability to keep up with the news. And such “alpha-seeking” strategy is extremely underdeveloped in algorithmic trading, says Mr Hooper—not because of any lack of demand for it, but because it is very hard to do. In this regard, human traders still have an edge over heartless robo-trading algorithms. But it is still early days. Algorithmic trading is still in its infancy: it has taken off only in the past four or five years, mainly due to the introduction of the

Financial Information Exchange Protocol, which has done for trading what the internet's TCP/IP protocol did for data networking, by allowing different proprietary systems to plug into a common standard.

Some programs do exist that make decisions about which shares to buy and sell. These are used for statistical arbitrage—the practice of monitoring and comparing share prices to identify patterns that can be exploited to make a profit. In the past, software has been used to carry out this sort of analysis and identify, for example, that the best time to buy a particular company's shares is when the spread between its share price and that of a rival firm has reached a certain value. Historically, this information would then be passed on to a human trader to act on. But these days, statistical arbitrage systems are often plugged straight into the market, and can place their own trades.

Might that not be rather risky? Some blamed the 1987 stockmarket crash on computers instructed with simple decision-making rules. These essentially amounted to little more than “if-then” rules of thumb: if a share price drops below a certain threshold, then sell. When a market is falling, this can make a bad situation worse, as low prices prompt more traders to sell, which further depresses prices. Yet despite such worries, the industry has continued to embrace the technology. Indeed, part of the reason for computerising exchanges such as the London Stock Exchange and NASDAQ was to facilitate algorithmic trading, says David Birch, head of research and development at the London Stock Exchange.

Some exchanges now regulate the use of algorithmic trading, both to prevent their systems from being overloaded and to avoid a repeat of the 1987 scenario. On July 7th, for example, the London Stock Exchange asked for algorithmic trading to be suspended after the London bombings. Even though it is impossible for an exchange to tell whether a person or an algorithm is issuing trades, it is possible to monitor the rate of trading to tell whether algorithmic trading is going on, says Mr Birch; human traders cannot issue several trades per second. But a greater dependence on algorithmic trading could eventually make it impractical to order such trading to be suspended, he says.

Mr Balarkas believes the risks are minimal, and that it may not be necessary to switch off algorithmic trading. “By definition, execution algorithms are stealthy and designed to create as little volatility as possible,” he says. And the very fact that they are designed to reduce the market impact of trades should, in fact, have a stabilising effect. No one wants a repeat of 1987, says Dr Cliff, and nobody would knowingly implement an algorithm that they thought might cause a crash. The trouble is, he says, that the secrecy that surrounds these algorithms means that there is no way to evaluate how various trading systems might interact with each other. It is an intractable problem. “But without hideous levels of regulation there is no way round it,” says Dr Cliff.

Beyond worries over market stability, might an even greater danger be lying in wait? Mr Hooper proposes a doomsday scenario. Some day, advances in natural-language processing and statistical analysis might lead to robo-traders capable of analysing news feeds, deciding which shares to buy and sell, and devising their own strategies. Given that companies are very keen to patent their algorithms, it is quite possible that just one company could then emerge as the victor in this algorithmic arms race, says Mr Hooper. This outcome would create a particularly challenging problem for regulators. “It is a possibility that you could have an unfair advantage—and there would be nothing governments could do about it,” he says.

It is an interesting idea. But it seems unlikely, since there are so many possible trading strategies, and unlike simpler problems in computing (such as sorting a list) it is doubtful that there will turn out to be a single trading algorithm that outperforms all others. Yet perhaps such a suggestion should not come as a surprise. For whenever robots are being discussed—even if they are merely the software-based, share-trading variety—the idea that humans will lose their jobs and the robots will take over the world always seems to be lurking in the background.

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