Into battle with the algorithmic warriors

Algorithmic trading systems are an increasingly popular weapon with which banks aim to annihilate the competition. Dan Barnes explains

While Hollywood directors use computer graphics in their movies to create hordes of synthesised warriors from a few images, investment banks are using the technology of algorithmic trading systems to scale up their number of traders, enabling greater volumes of deals to be made without increasing the trader's workload or costs significantly.

Competition to build the best algorithm is fierce, as Chris Marsh, vice-president in advanced execution services at CSFB, notes. "To describe it as the financial services equivalent of *Robot Wars* is exactly accurate," he says. "Everyone is out there to destroy one another. We don't get to use pickaxes and flame-throwers but the concept is just the same."

Picking your weaponry is equally important in both instances. The real advantage that algorithmic trading provides is taking large trades and breaking them down into differently sized and timed trades according to a predetermined strategy. The role of the trader is to determine the strategy that the algorithmic system employs, thus allowing them to focus on further strategies rather than managing the trades themselves, essentially eliminating the leg work for the human element.

Changing game

As these skills evolve within the bank so do the algorithms – in some cases quite literally. "We do have algorithms that alter themselves over time and there are also ways that we can change their behaviour," says Mr Marsh.

At CSFB, the algorithms themselves are rewritten every seven to eight months on average. They must constantly change to remain ahead of the game according to the environment so the analogy of 'evolution' sits well in the field (although proponents of 'intelligent design' may disagree). At investment management consultant Citisoft, senior consultant Sunil Chadda sees the extinction of early algorithms occurring already. "The VWAP algorithms have been broked out of the market – there are so many people using them that they're becoming ineffectual – that is the nature of technology," he says.

If a trade has been broken down into regular chunks and is carried out at regular intervals then there is a good chance that the pattern will be spotted. As with any business, a public face can be read by competitors and can be played against. In the algorithmic world the costs of this can be greater, with banks running the risk of their strategies being reverse-engineered.

Design is key

"Proprietary traders can take advantage of badly designed algorithms," Mr Marsh explains. "For example, imagine a simple algorithm that in a buy situation tried to get done by laddering bids at various price levels and also tried to be the best bid in small size. It sounds like a perfectly reasonable way to handle the order. But if not designed properly, such an algorithm could be easily spoofed by other traders who could get it to chase a price and leave ever higher bids.

"Competitors who are really sellers can spoof and insert a bid slightly ahead of the best bid (commonly referred to as 'pennying' a stock). So then the dumb algorithm simply assumes there is a competitive bidder and goes best bid again at a higher price and so on, until the spoofer removes all his bids and hits all the bids left on the book by the algorithm."

Human mimic

To counter this on a simple level, the algorithms are built to mimic human behaviour so that inconsistencies and slip-ups (without any detrimental performance characteristics) occur.

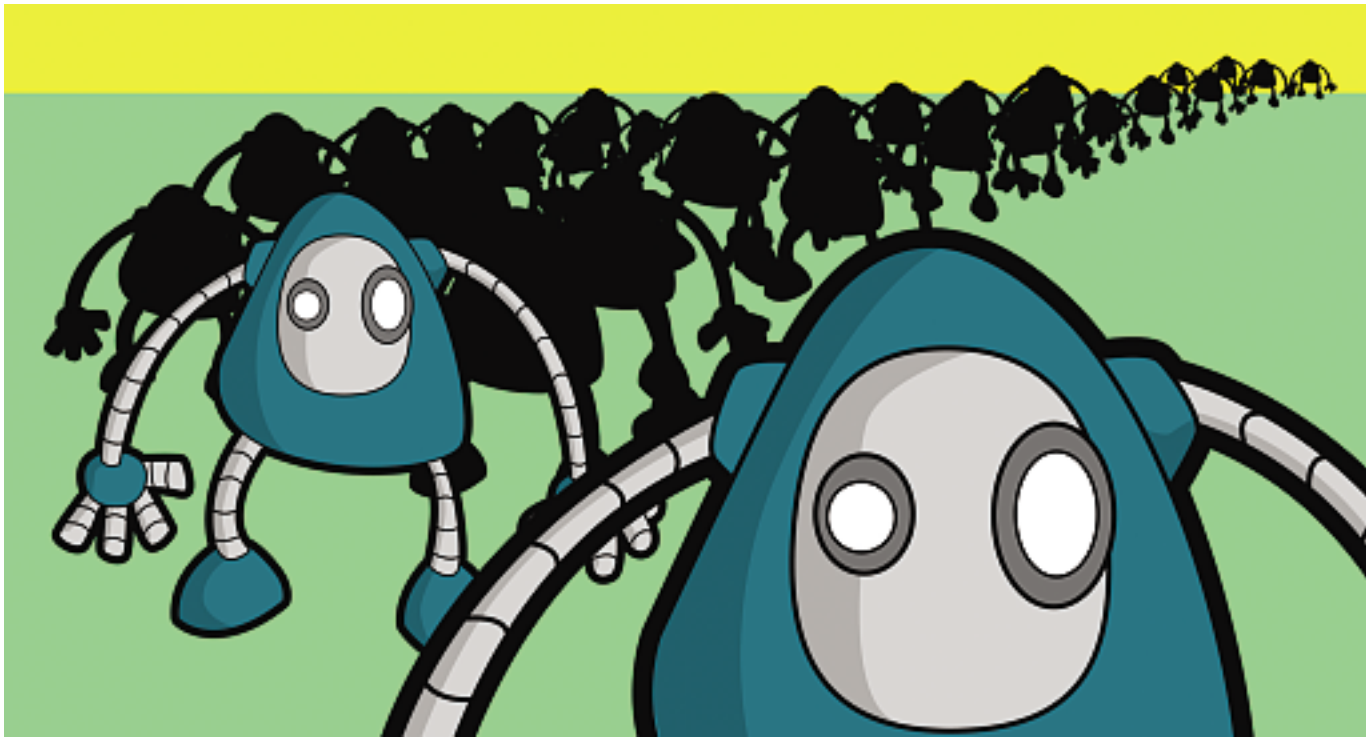
Market players are also often running thousands of variations of an algorithm against current market conditions as if they were live to find new, functional models. John Bates, vice-president of event processing at Progress Apama, likens it to "a primordial soup, where they're all variations of the algorithm with slightly different parameters".

As Jonathan Kinlay, CEO of hedge fund Proteom Capital explains, although there is a similarity to the concept of genes continuing or dying off according to their success, algorithms are much more tightly controlled: "Genetic algorithms continue to mutate and change. We do not allow algorithms to do that. We want the virtual traders (algorithms) to be consistent – if their strategy works they continue. We also don't want them to all follow one route to success. We keep low correlations between some of our strategies. If a strategy doesn't work, it simply doesn't work."

This testing should identify any potential for replacing a live algorithm with an improved product and keep the organisation one step ahead, and is a constant process at CSFB, says Mr Shaw. "While the objectives of a particular strategy may remain constant, like a living organism, parts of it are changing all the time and no part probably remains static for more than a few months. When we adapt a strategy we release it to internal users and in effect

WHAT IS ALGORITHMIC TRADING?

ALGORITHMIC TRADING involves 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 the goals for the trade as specified by the parameters and constraints that the trader inputs to the algorithm.
(Source: **TowerGroup**)



run it up against its parent. If the new one is an improvement, it's a winner and it goes into production."

Such a switch is not a difficult process at the bank, something their team attributes to the method by which they have written their code base and their utilisation of algorithm writers to determine market needs, rather than relying on an additional tier of workers.

Complement not replace

There are misconceptions about the algorithmic trading world. Some people herald the systems as a replacement for traders – others deny that they could perform this feat. The reality at the moment is a mix of the two positions.

In certain markets, there are fully automated traders, says Dr Bates. "Systems that act as autonomous traders do exist but they are less commonplace. Quite often they will be a complement to a trading floor so we see, for example, foreign exchange systems that are almost a robotic replacement for a trader," he says. "The physical traders get priority over the automated traders, which are really there to mop up the smaller deals while the high value deals will be handled by the human trader."

Everyone in the business is keen to stress that 'replacement' is not the idea so much as 'supplement'. It is not hard to see why. The financial world has been rocked by extraordinary events and these are the bane of any automated system's existence. A computer cannot deal with the 'one in a million' occurrence that can rapidly change the state of a market – 'unusual' will rarely be found in such a system's vocabulary or options. For this reason, systems can be switched to manual activity if that becomes necessary. Certainly, regulators are unlikely to approve of a hands-off approach any time soon.

Dr Bates points to the recent London bombings as an example of concerns being raised. "There were requests to deactivate the algorithms over that period because they could take advantage of the sentiment in the market and could have driven things badly down. That was an interesting phenomenon because you're seeing something even more ruthless than a trader. It just runs according to the metrics. I found the potential for a regulator to say 'turn off your engines' interesting."

> 'To describe it as the financial services equivalent of *Robot Wars* is accurate. Everyone is out to destroy one another'

Marching forward

In the future, the level of automation in trading is expected to increase. More competitors will come in to play as the barriers to entry are lowered, keeping the incumbents on their toes. "We have to continually march forward or someone's going to come over and eat us," says Mr Marsh – although to some degree he influences the rules under which the game is played.

"We recognise that we are changing the face of the way any market we enter trades. One of the CSFB mottoes is 'Empowering change' and we are at the leading edge of that."

Andrew Byde of HP Labs believes that not only is algorithmic trading here to stay, but also it will determine the shape of the future market.

"Instead of adapting the agent, it might be a good idea to adapt the market it operates in," he says. "If more and more trading becomes automated – which it is doing – thinking ahead a few years, you can imagine a world in which all trading is done by computers. Then you have to start asking: why are they participating in a market in which the rules are designed for human participants? Maybe we should think about how the markets can be changed." TB