While the concepts that drive modern markets have remained consistent over time, in recent years we have witnessed the game changing impact of a new generation of high-frequency liquidity provider. Proliferation of dark pools, regulatory changes such as MiFID in Europe and Reg NMS in the US have accelerated the emergence of this new breed of trader. Their strategies are familiar, but their implementation techniques are cutting edge. Increasingly, high-frequency machines have replaced humans in providing liquidity to the market. For old-style, 'trade like a trader' sell-side algorithms, this new environment is a game of cat and mouse – a game in which a draw, or the demise of the mouse are the only possible outcomes.

Common strategies

High-frequency trading (HFT) is quite a broad term which needs to be broken down into subsets to be better understood. We categorise three styles of HFT:

Statistical arbitrage trading – This involves the selection of correlated instruments or baskets and identification of price discrepancies between them. You buy what is relatively cheap while

A game of cat and mouse

Alex Paley, global head of algorithmic product development, global markets equity, Deutsche Bank, explains why users of first-generation algos must adapt to growing high-frequency trading volumes.

Alex Paley

shorting what is relatively expensive, wait for the spread to collapse back to expected levels, and unwind the position at a profit. This style of trading keeps prices in line and creates a more efficient market. But if you are sourcing liquidity from a black box, on average over the short term, what you bought will go down and what you sold will go up. Such strategies have been around for years, the difference now is one of time horizon. Only machines can spot and take advantage of price movements over seconds. The price disadvantage received by trading with this black box might seem miniscule at first, a few basis points here and there, but price discrepancies of this nature happen so often that the overall cost of inefficiently sourcing this type of liquidity can add up quickly.

HFT market making – Market making has also always existed, what has changed is the introduction of statistics and machine

automated techniques to scale the process. This combination of traditional market making - human decision-making – with the speed and precision of machines is often referred to as 'grey box' trading. In the past, market makers upon receiving an influx of buy orders for a particular sector would have to manually adjust their inventory and quotes with only rudimentary software tools. However, in the HFT era, market makers are able to activate a momentum-trading-style box, instruct it on sector, risk parameters, stop-loss constraints etc, and fire it off with just a few clicks of a button. Moreover, market makers have always been privileged with access to asymmetrical information derived from displayed orders of different market participants. This asymmetry is now magnified by the addition of feedback grey boxes provide. If the necessity to proceed with caution when interacting with market makers

existed before, this need is greatly amplified today.

'Special situation' HFT trading bots – The basic concept of 'special situation' trading has been around ever since traders have been sitting in front of a market data trading terminal. Any trader who noticed some pattern of activity and implemented an automated tool to navigate it completed the first step in creating a HFT trading bot – identifying a potential tradable anomaly in the market. HFT trading bots are difficult to characterise since they span such a large range of ideas and time intervals and are limited only by the imagination – from ultra-short-term directional quote predictions to reverse engineering a large order from the tape.

The scenarios described barely scratch the surface of the HFT landscape, but provide a glimpse into why first-generation electronic tools are incapable of competing with the reality of trading equities in 2010. Such algorithms are built on two principles:
1. **Statistical analysis** – Works 'on average', performance is achieved by discarding the outliers, making the assumption that you receive a normal distribution of outcomes with the positive and negative

outliers cancelling each other out. All traditional implementation shortfall, portfolio trading algorithms, and schedule based algorithms (VWAP, TWAP, percentage of volume) are built around this concept; and
2. **Automated human-like execution rules** (aka heuristics) – For example, source as much dark liquidity at mid-point as possible. Most, if not all, liquidity-seeking, dark-only and special purpose tactics (peg and pounce, volume scaling, etc) are built this way.

The problem with statistical analysis in the modern landscape is that the HFT model types described above tend to create a disproportionate amount of negative outliers, while the number of positive outliers remains unchanged. Since the math behind statistical analysis demands equal chance of positive and negative outliers to work, deterioration in overall performance is the only likely outcome.

Automated human-like execution rules are similar in spirit to HFT bots. They both attempt to exploit market inefficiencies using the same idea generation process.

However, after trying many ideas that seemed logical in a formal back test, we discovered that only about one out of every ten ideas were actually worth pursuing. Moreover, even the ideas that seemed promising required extensive calibration and conditioning before they were ready for use. More often than not, an idea that sounds logical, simply doesn't work when put into practice.

Adapt and survive

The continued growth of HFT liquidity appears inevitable – they employ hundreds of the best minds in the field and have the capital to invest in research and to perfect grey box trading techniques. If first-generation algorithms fail to adapt to this growing trend, the P&L slippage of their strategies will continue to increase. The only way to navigate and effectively interact in this new liquidity age is to play by the same rules and incorporate HFT techniques to level the playing field. Without incorporating such techniques, in the battle of cat and mouse, there is no longer anywhere for the mouse to run and hide. ■

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