High-frequency traders have recently found themselves at the centre of the financial media’s attention in relation to their impact on market efficiency and fairness. The catalyst for the scrutiny was the understandable concern being voiced over the use of ‘Flash’ orders by Direct Edge, BATS and NASDAQ in the US. Although this feature has never been offered by any European venue the publicity has increased the buy-side trader’s awareness of the presence of automated high-frequency activity and raised some interesting questions on the impact that the greater participation of high-frequency traders is having on European markets.

To set the context, quantitative, automated trading strategies have existed for as long as FIX protocol has allowed direct electronic access to the market. Over time, this type of trading has become a more significant component of the market as the success of these strategies has encouraged new entrants. Technology improvements, regulatory change and reduced marginal trading costs have also assisted by reducing the barriers to entry.

To appreciate the implications of the presence of high-frequency activity we need to understand the types of strategies employed by these traders and the features that are important to them when looking to access a market. We can also make some interesting observations by comparing the mature high-frequency market in the US with Europe’s less saturated but fast evolving environment. The presence of this increasingly significant trading group has considerable impact on other market participants, not least the sell-side firms providing algorithmic and SOR products and the buy-side users of those tools.

In terms of strategies, automated high-frequency traders tend to
fall into one of two categories: statistical arbitrageurs and electronic market makers. Statistical arbitrage techniques identify short-term opportunities where securities and derivatives are mispriced. The mispricing can occur across venues, asset classes or over time having been identified using reversion and correlation techniques. Electronic market making strategies attempt to capture spread and earn rebates while managing positional risk in real time. All are reliant on powerful mathematical programs that consume vast amounts of data and processing power to identify pricing differentials in the marketplace. These strategies generate large volumes of small to medium sized orders and hold positions for short time periods. Their volume means that they are highly sensitised to transaction costs and operational efficiency. Many are also sensitive to market data, hardware and network connectivity routing speed (latency) although not all measure latency in microseconds (millionths of one second).

High-frequency trading strategies: the drivers
From a European standpoint one of the major catalysts for the increased presence of automated high-frequency traders was the advent of MiFID in 2007. Through increased competition, the EU directive prompted an improvement in product choice and technical capability whilst concurrently forcing down the marginal cost of trading. Furthermore, the new venues that entered the European marketplace would live or die by the liquidity that they offered and many pursued a strategy of building technology and pricing models designed with the automated trader’s requirements in mind. Lower marginal costs (or marginal revenues from liquidity provision) and more acceptable latency from a risk management standpoint lowered the breakeven point and increased the viability of many strategies facilitating an increase in activity.

More recently, FSA clarification on the requirements of Sponsored Access, as well as regional infrastructure improvements, have increased the pace of demand for hosting and co-location services that help overcome the latency consequences associated with physical distance (at a healthy eight microseconds-a-mile, a trip across the Atlantic ‘costs’ around 70 milliseconds [thousandths of a second]).

It’s sensible to be wary of the unknown and the sound bites associated with automated trading
understandably generate concern for participants used to a more traditional way of executing. By the same token it should be reassuring that the reason microseconds or a couple of miles between data-centres does not register on most traders radar is that it is relatively inconsequential to them. Automated traders are not competing to be another microsecond quicker than a sell-side cash trader or a long only buy-side dealing desk, they are competing with each other for opportunities that might exist for only a fraction of a second. When automated traders employ similar strategies being second to respond is no better than being last.

High-frequency automated traders invest heavily in data handling capabilities in order to maximise ultra short term trading opportunities, providing liquidity, narrowing spreads and removing inefficiencies associated with a slower responsiveness to data. They use computing power to improve information quality and timeliness and, like all other participants, they respond to liquidity signals and supply and demand imbalances. They will react to clumsy and inefficient trading and will take the other side of the trade once a departure from fair value is identified.

High-frequency trading: comparisons across the pond
In an environment as complex and diverse as the cash equities market it is difficult to isolate the consequences of the behaviour of certain participants on the market as a whole. Various recent studies by TABB Group and other industry sources have put high-frequency activity in the US at somewhere between 50-70% of all liquidity, while the European equivalent statistic is thought to be only around 20-30%. Whatever the precise numbers, what is in no doubt is the fact that high-frequency activity in the US is significantly greater than Europe and therefore a comparison of the two markets will, at a simplistic and high level, help to provide some useful insights into the impact of automated high-frequency traders on the marketplace as a whole.

The STOXX 600 and S&P 500 are indices with similar market capitalisation values at $8.6 trillion and $9.2 trillion respectively (close prices from 31 August 2009). Anyone that has traded the components of both indices will know that the characteristics of the order books are significantly different. We believe that this difference is in part influenced by the extent to which automated high-frequency traders account for activity in
Spreads are an important component of the total cost of trading and significant effort goes into designing sell-side algorithmic ‘micro traders’ that work the individual child orders without crossing the spread. The average spread on the S&P 500 in August was more than three times tighter than the STOXX 600 at 5.33bps versus 16.54bps. Even stripping out the least liquid 400 names of the STOXX 600 only reduces the average spread to 10.33bps. Tick

![Figure 1: Comparison of STOXX 600 and S&P 500](image)

**Source:** Deutsche Bank Global Markets using Thomson Reuters data

1. Source: World Federation of Exchanges
2. Outliers with low turnover and high prices, LISN.S and MAERSKb.CO were excluded
sizes have an influence here but only account for around 1.5bps of the difference, the average tick increment of securities in the STOXX 600 being just over 6bps versus 4.5bps for the S&P500. The additional liquidity provided by high-frequency traders and their tendency to gravitate around best bid-offer could be one of the factors behind the tighter spreads witnessed in the US market.

Adjusting for abnormal outliers (Lindt and Maersk) in the STOXX 600, a comparison of notional median top of book size and notional median fill size also proves insightful. Despite the presence of round lots in the US, the median fill size on the STOXX 600 ($19,941) is more than triple the median fill size for the S&P 500 ($6,305). Median top of book meanwhile is more than double at $79,477 and $31,335 respectively. In order to manage risk and minimise footprint, high-frequency traders tend to use smaller orders and rely on low latency infrastructure to reload if required. It is therefore again reasonable to assume that the lower trade and bid-offer sizes are in part a consequence of greater proliferation of automated high-frequency order flow in the US when compared to Europe.

The ability of high-frequency traders to submit smaller orders is significantly driven by the marginal cost of trading. The cents-per-share model preferred by US venues allows for significantly greater slicing of orders than the charge-per-fill price models of some European venues and clearing agents (in effect European traders need to manage the number of fills when trading a given notional amount, whereas US traders are agnostic from a cost standpoint). For obvious reasons, traditional traders typically prefer to participate with deeper pockets of liquidity and are therefore likely to perceive smaller fills negatively. Indeed, recent trends towards smaller top of book and fill sizes have been the drivers behind the popularity of dark venues that re-aggregate block liquidity, and also of liquidity-seeking algorithms. This is not quite the whole picture though, since one of the other features of high-frequency activity is increased reload speed and velocity of fills. We also see this come through in the data, with the average median velocity of fill for an S&P constituent being 9.61 fills-per-minute versus 3.26 fills-per-minute for a STOXX 600 constituent (N.B., US markets are also open for two hours less than Europe’s markets each day). Venues with fast reload rates tend to be low latency, meaning that a price...
taker can leverage opportunities to reposition by rapidly revisiting a venue even if original displayed liquidity is small. High-frequency traders have also been accused of increasing the volatility caused by recent economic uncertainty through their increased presence in markets. The data from August does not support this, with the European V2X registering a monthly decrease of 0.03% and the US VIX registering a monthly increase of 1.76%. As with spreads, the lower US volatility could be due to the additional liquidity brought to the market by the high-frequency participants and their ability to rapidly interpret data and take the edge off market inefficiencies. This conclusion seems logical on many fronts. Advocates of the efficient markets hypothesis assume that assets will revert to equilibrium price given perfect information. While there will never be perfect information, it is reasonable to assume that more participants trading off better quality, more timely data will increase efficiency.

The last comparison to highlight is the difference in average daily consolidated value traded per stock. The average daily consolidated turnover for an S&P 500 name is $331 million versus $236 million for a STOXX 600 constituent. All things being equal, one of the major differences between trading an S&P 500 versus a STOXX 600 name is the likelihood of participating with high-frequency traders. On the plus side, their increased presence might be one of the factors behind the greater liquidity, tighter spreads and lower volatility of the US market. On the negative side, they appear to have contributed to smaller fill sizes. Net-net on this basis their impact is favourable.

Consequences of high-frequency trading
In practical terms there are several consequences of these observations for the buy-side consumer of algorithms and smart routing technology and the sell-side cash trader. First of all, the vast majority of automated high-frequency traders employ legitimate techniques to pursue opportunities in the market. As such, other European market participants should assume that they are here to stay and that their activity levels will increase as technology improves and competition reduces costs. Consequently it is important that the buy-side and sell-side alike invest in market data and trading technology with the ability to handle the increased tick and quote speed, as well as the increased fill rates that more high-frequency activity generates.
If the short term information advantage of high-frequency traders remains a concern to certain participants then it is important to understand the types of trader that preference a venue and the diversity and nature of liquidity available there. Many of the newer venues have been built with a particular target participant group in mind and as a result have a much less diverse pool of liquidity. To maintain control of order flow it is important to understand brokers’ routing logic and opt out of any venues with matching models that are opaque. A shotgun approach to liquidity aggregation can sometimes unnecessarily compromise the trade off between quantity of fill and quality of fill.

It would be naive to assume that gaming risk does not exist, therefore tactics should be employed to prevent it. Avoid predictable and systematic behaviour and understand the anti-gaming logic employed by broker algorithms. Submissions to the market should be randomised in terms of size and timing when using schedule-based strategies, making the tape more difficult to read. Appropriately used dark venues can minimise footprint, while algorithmic features that allow behaviour to change dynamically relative to absolute and relative prices vastly improve control and mitigate risk.

As venues and participants get quicker, brokers with a lower latency infrastructure have an advantage over those that have failed to invest. Smart order routers and liquidity-seeking strategies need to be able to process market data signals quickly and get orders to venues rapidly in order to compete with other aggressive orders in the market and to seize short-lived opportunities presented by the liquidity providers. The low latency world means that these ultra short dated options are often not available for long.

Regarding liquidity provision, electronic market makers sometimes frustrate other passive participants by competing for liquidity at the touch. It is important that schedule-based strategies do not respond to this; deeper into the book high-frequency activity is less prevalent and longer duration passive orders are less likely to be disadvantaged. When trading with high urgency and crossing the spread, that same liquidity benefits the traditional traders by adding to availability and tightening the spread, thereby reducing transaction costs. Explicit transaction costs are also reduced as venues continue to aggressively compete for
the liquidity provided by high-frequency participants, ultimately benefiting all investors. Trading is one of the most competitive aspects of an intensely competitive industry and all participants seek an information advantage, it’s the nature of the business. The investment horizons might be different, but the ultimate objectives of retail, institutional and high-frequency traders are consistent – the pursuit of profit. Everyone is wary of the participant that they feel has an advantage and conversely wants to participate with flow they feel they have an edge over. As long as the advantage is legally derived from innovation, investment and application of intellect, it should not be penalised. In the real-time trading environment, the world where the loudest voices and sharpest elbows in the room once had the edge has simply given way to one where improved analytical capability and application of technology is more likely to deliver an advantage. To the extent that it leads to a lower cost, more liquid market this progress should be welcomed.