

A short introduction to automated and high-frequency trading

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Abstract

This article shortly describes what is meant by automated trading and by its subfield, high-frequency trading (HFT), in particular. After a brief look at the historical evolution of automated trading, we discuss in broad terms what HFT is and what kind of strategies are typically employed in that field.

Introduction

Financial markets have been in turmoil for the last few years. Not only have we experienced financial disasters in the form of Lehman Brothers bankruptcy and the subprime crisis, we have also witnessed subtle but important changes in the microstructure of financial markets. As a consequence of these changes, the “New Masters of Wall Street” are the high-frequency trading (HFT) firms.² This short article describes what automated trading and HFT is about and where it comes from.

Brief history of automated trading

Automated trading, and HFT in particular, has risen seemingly out of nowhere to

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² Forbes (September, 2009): “The New Masters of Wall Street.”

<http://www.forbes.com/forbes/2009/0921/revolutionaries-stocks-getco-new-masters-of-wall-street.html>

public consciousness in just a few years time. But like many other “new” concepts, HFT has existed some good time before its appearance in the news headlines. HFT can be traced back to at least the 1990s when computer technology became accessible to broader audiences. Firms like Renaissance Technologies and Prediction Company were successful at HFT early on. For more than a decade, the field of HFT managed to stay out of the public radar due to its marginality and secretive trading practices.

Proprietary trading firms and funds were not the only ones attracted to automated trading. Stock exchanges got interested in automation of trading and display of quotes in the late 1990s. The biggest stock exchange in the US around those times, the New York Stock Exchange (NYSE), was first against automation. Their negative stand was mainly due to their floor-based trading system using “specialist” market makers who had much to lose in privileges if automation would proceed as planned. Nevertheless, the US regulatory authorities pushed towards more equally working liquid markets. The consequent competition from efficiently operating Electronic Communication Networks (ECN) forced the old giants to embrace automation and HFT caught fire.

The rise of the machines in financial markets has been fast in the 2000s. Now most trading is executed in an automatically, whether by HFT firms using trading strategies or firms using algorithms to gain better execution prices for large orders. According to a financial research firm TABB Group (2009), HFT accounts for 61 percent of all US equity trading volume in 2009. In 2006, it was half of that.³ Although we see some trending decline after 2009, the percentage in certain stocks is as high as 80.

The relatively high technological requirements of automation has put HFT out of the reach of laymen and most traders. And because of the traditionally secretive nature of proprietary HFT firms – which are now much more numerous than ten years back – there is mysterious aura over automated trading. Add in an element of mathematical

³ TABB Group (2009): “US Equity High Frequency Trading: Strategies, Sizing, and Market Structure.”
<http://www.tabbgroup.com/PublicationDetail.aspx?PublicationID=505&MenuID=13&ParentMenuID=2&PageID=8>
<http://www.advancedtrading.com/algorithms/220301041>

sophistication and high-level programming and there you have it: HFT is the new rocket science of the electronically operating, speed-of-light craving Wall Street.

What HFT is

The fact that HFT is incomprehensible to most people makes it hard to discuss the concerns of its pros and cons. It is hard to pin down HFT exactly as there is no universally accepted definition of it. As the definition varies, so do the answers to the raised concerns. The consensus is that HFT is automated trading executed at high-frequency level. But how high the frequency must be for the trading to be considered HFT is open to debate. Some speak of holding times of hours, minutes, or seconds. The most technologically advanced speak of sub-seconds (milliseconds or faster).⁴ For most people involved in trading, however, buying and selling stocks at a time-scale of minutes is already high-frequency. We accept such a rather broad definition.⁵

HFT firms use a wide array of trading strategies, typically kept as trading secrets. Although specific trading strategies are not revealed, they can be categorized based on what type of trading it involves. The really fast HFT involves market making: constant buying and selling of assets. But in contrast to the specialist market makers that ruled the NYSE years ago, the market making practices of HFT firms are more opportunistic in nature. They are sometimes accused of withdrawing liquidity at the times of the highest need.⁶ HFT firms take advantage of market liquidity imbalances and other short-term pricing inefficiencies that rise and disappear fast. Most HFT firms do not carry positions overnight, except in certain types of (convergence) arbitrage strategies. This lowers the risk of adverse movements or news that hit the market at a time without a chance to react. This also means that the times close to the closing of the exchanges tend to be very active as HFT firms attempt to close their

⁴ New York Times (July, 2009): "Stock Traders Find Speed Pays, in Milliseconds."
<http://www.nytimes.com/2009/07/24/business/24trading.html>

⁵ More precisely, however, an automated trading model is about determining whether a trade should be placed, while an algorithmic trading model is about determining how to place it. This distinction is sometimes important to make.

⁶ Reuters (August, 2011): "The Madness of Wall Street."
<http://www.reuters.com/article/2011/08/19/us-markets-volatility-idUSTRE77I2SA20110819>

positions before night. Another typical feature of HFT strategies is “market neutrality”: the direction of the market is irrelevant. What matters is price dynamics.

Closing words

This introductory text only gives a glimpse of what HFT is and it is necessarily general in its scope. Nowadays, there exist several popular articles that discuss the topic – some of them have been referenced here. However, these articles typically lack a neutral and scientific look at HFT. We have not dwelled into the details of HFT nor have we attempted at a scientific look either, but note that the positive and negative side-effects of HFT has become a hotly debated topic. There are several points that speak for the value of HFT. But there is opposition too, as mentioned in the previous section. In a forthcoming article, we describe the pros and cons of HFT.