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The Low-Down on High Frequency Trading

Some 220 years ago, a group of stockbrokers gathered under a buttonwood tree in lower Manhattan. They had just survived the Panic of 1792 where a stock market frenzy created by prominent bankers had ended badly for everyone. Bankers and brokers were being blamed and the brokers thought that if they formally organized, order and confidence in the market would be restored and their businesses would be protected from outside influences.

The result of their meeting was a pledge to buy and sell only from each other and an agreement that their commissions would never be less than 0.25%. Through these two simple and straightforward declarations, the brokers established the "Buttonwood Agreement" and the beginnings of the New York Stock Exchange.

Today, Wall Street is anything but simple or straightforward. Commissions for buying and selling stocks vary greatly -- from do-it-yourself over the internet to full-service, full-commission brokerage firms. The New York Stock Exchange is still the largest stock market in the world but now there are many other venues on which to trade stocks. And instead of human beings bargaining face to face on the trading floor, sophisticated computer systems buy and sell stocks through vast electronic networks.

Over the last decade, technological advances have helped foster a new activity on Wall Street called high frequency trading, or "HFT." Firms with fast, automated computer systems and proprietary algorithms rapidly trade large volumes of stocks in the hopes of making a profit on each trade. Ten years ago, the average time it took to buy or sell a stock on the New York Stock Exchange was about 20 seconds. Now, tens of thousands of orders can be completed in the blink of an eye -- a micro-second. As one observer noted, if supermarkets used HFT programs, the average household would be able to complete its shopping for a lifetime in less than a second.

But impressive as these feats are, it is becoming increasingly clear that such speed has a price, in more ways than one. There are growing concerns on Wall Street, in Washington and around the world about how high frequency trading may be affecting the financial markets and what should be done about it.

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Automated trading first appeared on Wall Street over forty years ago. In the early 1970s, the New York Stock Exchange started routing buy and sell orders electronically to the appropriate posts on the trading floor where human traders would then complete the orders manually. The first high frequency trading firm, Automated Trading Desk, was established in 1988. By the year 2000, there were a number of highly profitable HFT firms.

With continuing advances in technology, more HFT firms were established. Over the five years from 2005 through 2010, high frequency trading grew from less than a fifth to upwards of two-thirds of U.S. trading volume. Even Citigroup, a global financial institution, got in on the action by purchasing Automated Trading Desk for \$680 million in 2007.

Speed is of the essence for HFT firms. They design their algorithms around a specific trading strategy, some of which are similar to the market-making actions of human traders while others involve statistical arbitrage. In these latter strategies, the algorithms detect and exploit anomalies in the prices of stocks. By rapidly trading a stock, an HFT firm strives to make a profit on the difference between the purchase and sale price. This profit may be only a fraction of a penny but with thousands and thousands of trades, the strategy can be very lucrative.

Because competing algorithms all tend to pounce at once on the same opportunity, HFT firms have to be able to adapt their existing algorithms just as quickly or rapidly adopt new ones. By some estimates, the shelf-life of an HFT algorithm is measured in weeks.

The hardware deployed by HFT firms is also geared towards speed. It typically includes extremely fast supercomputers capable of processing and analyzing huge quantities of data as well as networks based on new technologies. For example, a new fiber-optic cable currently is being laid across 3,000 miles of the Atlantic Ocean to connect HFT firms in New York and London. This cable will reduce the time it takes data to travel back and forth between the two cities by 5 milliseconds -- a tiny, but important, speed advantage. According to one observer, "That extra five milliseconds could be worth millions every time they hit the button."

Reducing the physical distance data has to travel from supercomputer to supercomputer increases the speed at which the data moves. This is called "latency" -- the time it takes a trade to be initiated and completed. Low latency is the aim in high frequency trading, and zero latency -- where data travels instantaneously -- is its ultimate goal. HFT firms talk longingly of the "race to zero."

To get to "zero," some firms locate their supercomputers as close as physically possible to the exchange where they trade by renting nearby office space. Other HFT firms lease data lines from the exchange that feed directly into their supercomputers which also reduces latency. But achieving lightning fast speed has its pitfalls, as the firm Knight Capital discovered almost a year ago. Founded in 1995, Knight was a global financial services firm that also engaged in high frequency trading. It was the largest trader in U.S. securities with an estimated 17% market share of the New York Stock Exchange.

Last summer, the firm installed new trading software but when the markets opened on the morning of August 1st, the algorithms went wild. During the first 45 minutes of trading, Knight's software aggressively bought and sold \$7 billion worth of 140 NYSE-listed stocks -- about \$2.6 million a second. As the software bought shares, the algorithms would then raise the price it was offering to purchase additional shares. Of course, other HFT firms were more than happy to sell at the elevated prices. The algorithms kept buying and prices kept rising.

When Knight finally realized what was happening, it had to shut down all of its trading businesses for the next few days. In order to unwind the errant trades, Knight had to spend \$440 million -- about 40% of its capital base. Ultimately, by the end of the year it had been acquired by another HFT firm.

A cynic would say that this was merely "Darwin at work" in the jungles of Wall Street. But more than just an HFT firm or two could be at risk from algorithms gone haywire -- as the Flash Crash of May 2010 showed.

During the Crash, the Dow Jones Industrial Average dropped nearly 1,000 points, losing \$1 trillion of market value, in just a matter of minutes. Then, almost as rapidly, it rebounded and recovered its losses. The share prices of eight major companies in the Standard & Poor's 500 fell to 1¢ a share while a number of others soared to over \$100,000 before settling back to their pre-crash levels.

After three years, there is still no clear explanation of what happened. The official findings released by the Securities and Exchange Commission and the Commodity Futures Trading Commission point to a mutual fund company that sold an unusually large number of stock market index futures contracts.

These were "E-Mini S&P 500s" that trade electronically on the Chicago Mercantile Exchange. A "mini" contract represents one-fifth of the regular Standard & Poor's 500 futures contract. The full size S&P 500 futures contract is widely traded and used by large, institutional investors to hedge risk. The "minis" are popular for their affordability, liquidity, and their ability to be traded around-the-clock.

The official explanation is that as soon as HFT algorithms saw the mutual fund selling its large position, they aggressively began to sell the same contracts. This accelerated the mutual fund's attempts at selling its own contracts. Sell orders begat sell orders and the market spiraled down until trading was paused for five seconds to restore equilibrium.

But as soon as the SEC's report was released, it was disputed and criticized by other regulators as well as by market participants and academics. Some assert that high frequency trading helped the situation by providing liquidity while others believe HFT aggravated conditions in an already fragile market.

In fact, even now there is no agreement as to whether high frequency trading is beneficial or harmful to the financial markets. Some maintain that HFT has lowered the “spreads” between bid and ask prices, thus lowering prices and improving liquidity. Others assert that less than 2% of U.S. equities are even subject to high frequency trading.

Governments around the world are currently considering how to regulate HFT. Some European countries are in favor of a financial transaction tax which would theoretically discourage all types of trading. In the U.S., a one-year pilot program has been implemented on the major exchanges with new trading curbs. These “limit-up/limit-down” curbs permit stocks to trade only within certain price bands. If prices breach the bands and do not move back into the permitted range, a five minute pause in trading will be imposed.

Interestingly, some believe that it was government regulation that gave birth to high frequency trading in the first place. The SEC’s Regulation NMS (“National Market Structure”) was designed in 2005 to “modernize and strengthen the national market system for equity securities” by fostering both “competition among individual markets and competition among individual orders.” Its goal was to promote efficient and fair price formation across securities markets and thus it basically encouraged traders and trading venues to automate, especially the New York Stock Exchange.

U.S. regulators are currently building their own supercomputer to fight fire with fire. Nicknamed “Edison,” it should be operational later this year and will be capable of performing two quadrillion operations per second. In theory, it should be able to track in real time every trade that takes place on every exchange. This capability should allow regulators to spot order imbalances as they develop and before they get out of hand, thus limiting the disruptive impact of HFT when market conditions are not stable.

Nobody likes volatile markets, but it is important for long-term investors to remember the difference between trading and investing. HFT firms try to capture minute pricing anomalies by getting in and out of stock positions multiple times. With many HFT firms competing with each other, industry profitability has fallen in the last several years. Also, the costs to maintain, improve and update HFT technology are continuous and enormous. The industry currently appears to be contracting with many HFT firms being acquired or closing up shop completely.

As long-term investors, our strategy is to recommend high-quality companies with real products and services, growing revenues and increasing earnings and dividends. We believe in holding on to the shares as long as the company’s management team is doing its job to increase shareholder value. We stay focused on the fundamentals of the company and do not get distracted by the “noise” of Wall Street traders chasing their latest “get rich quick” stock market rainbow. Investment success over the long haul is based on sure and steady progress, not thousands of trades in a micro-second.

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