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Stock Traders Find Speed Pays, in Milliseconds

By [CHARLES DUHIGG](#)

It is the hot new thing on Wall Street, a way for a handful of traders to master the stock market, peek at investors' orders and, critics say, even subtly manipulate share prices.

It is called high-frequency trading — and it is suddenly one of the most talked-about and mysterious forces in the markets.

Powerful computers, some housed right next to the machines that drive marketplaces like the [New York Stock Exchange](#), enable high-frequency traders to transmit millions of orders at lightning speed and, their detractors contend, reap billions at everyone else's expense.

These systems are so fast they can outsmart or outrun other investors, humans and computers alike. And after growing in the shadows for years, they are generating lots of talk.

Nearly everyone on Wall Street is wondering how hedge funds and large banks like [Goldman Sachs](#) are making so much money so soon after the financial system nearly collapsed. High-frequency trading is one answer.

And when a former Goldman Sachs programmer was accused this month of stealing secret computer codes — software that a federal prosecutor said could “manipulate markets in unfair ways” — it only added to the mystery. Goldman acknowledges that it profits from high-frequency trading, but disputes that it has an unfair advantage.

Yet high-frequency specialists clearly have an edge over typical traders, let alone ordinary investors. The Securities and Exchange Commission says it is examining certain aspects of the strategy.

“This is where all the money is getting made,” said [William H. Donaldson](#), former chairman and chief executive of the New York Stock Exchange and today an adviser to a big hedge fund. “If an individual investor doesn't have the means to keep up, they're at a huge disadvantage.”

For most of Wall Street's history, stock trading was fairly straightforward: buyers and sellers gathered on exchange floors and dickered until they struck a deal. Then, in 1998, the Securities and Exchange Commission authorized electronic exchanges to compete with marketplaces like the New York Stock Exchange. The intent was to open markets to anyone with a desktop computer and a fresh idea.

But as new marketplaces have emerged, PCs have been unable to compete with Wall Street's computers. Powerful algorithms — “algorithms,” in industry parlance — execute millions of orders a second and scan dozens of public and private marketplaces simultaneously. They can spot trends before other investors can blink,

changing orders and strategies within milliseconds.

High-frequency traders often confound other investors by issuing and then canceling orders almost simultaneously. Loopholes in market rules give high-speed investors an early glance at how others are trading. And their computers can essentially bully slower investors into giving up profits — and then disappear before anyone even knows they were there.

High-frequency traders also benefit from competition among the various exchanges, which pay small fees that are often collected by the biggest and most active traders — typically a quarter of a cent per share to whoever arrives first. Those small payments, spread over millions of shares, help high-speed investors profit simply by trading enormous numbers of shares, even if they buy or sell at a modest loss.

“It’s become a technological arms race, and what separates winners and losers is how fast they can move,” said Joseph M. Mecane of [NYSE Euronext](#), which operates the New York Stock Exchange. “Markets need liquidity, and high-frequency traders provide opportunities for other investors to buy and sell.”

The rise of high-frequency trading helps explain why activity on the nation’s stock exchanges has exploded. Average daily volume has soared by 164 percent since 2005, according to data from NYSE. Although precise figures are elusive, stock exchanges say that a handful of high-frequency traders now account for a more than half of all trades. To understand this high-speed world, consider what happened when slow-moving traders went up against high-frequency robots earlier this month, and ended up handing spoils to lightning-fast computers.

It was July 15, and [Intel](#), the computer chip giant, had reporting robust earnings the night before. Some investors, smelling opportunity, set out to buy shares in the semiconductor company [Broadcom](#). (Their activities were described by an investor at a major Wall Street firm who spoke on the condition of anonymity to protect his job.) The slower traders faced a quandary: If they sought to buy a large number of shares at once, they would tip their hand and risk driving up Broadcom’s price. So, as is often the case on Wall Street, they divided their orders into dozens of small batches, hoping to cover their tracks. One second after the market opened, shares of Broadcom started changing hands at \$26.20.

The slower traders began issuing buy orders. But rather than being shown to all potential sellers at the same time, some of those orders were most likely routed to a collection of high-frequency traders for just 30 milliseconds — 0.03 seconds — in what are known as flash orders. While markets are supposed to ensure transparency by showing orders to everyone simultaneously, a loophole in regulations allows marketplaces like Nasdaq to show traders some orders ahead of everyone else in exchange for a fee.

In less than half a second, high-frequency traders gained a valuable insight: the hunger for Broadcom was growing. Their computers began buying up Broadcom shares and then reselling them to the slower investors at higher prices. The overall price of Broadcom began to rise.

Soon, thousands of orders began flooding the markets as high-frequency software went into high gear. Automatic programs began issuing and canceling tiny orders within milliseconds to determine how much the slower traders were willing to pay. The high-frequency computers quickly determined that some investors’ upper limit was \$26.40. The price shot to \$26.39, and high-frequency programs began offering to sell hundreds of thousands of shares.

The result is that the slower-moving investors paid \$1.4 million for about 56,000 shares, or \$7,800 more than if they had been able to move as quickly as the high-frequency traders.

Multiply such trades across thousands of [stocks](#) a day, and the profits are substantial. High-frequency traders generated about \$21 billion in profits last year, the Tabb Group, a research firm, estimates.

“You want to encourage innovation, and you want to reward companies that have invested in technology and ideas that make the markets more efficient,” said Andrew M. Brooks, head of United States equity trading at [T. Rowe Price](#), a [mutual fund](#) and investment company that often competes with and uses high-frequency techniques. “But we’re moving toward a two-tiered marketplace of the high-frequency arbitrage guys, and everyone else. People want to know they have a legitimate shot at getting a fair deal. Otherwise, the markets lose their integrity.”

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