



**Your on the
Street Reporter**



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In a Split Second

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Hello from Your on the Street Reporter. In *The Nearly Perfect Storm: An American Financial and Social Failure*, I wrote on page 232 about a topic that made the lead story on *60 Minutes* tonight. The addendum to this report provides quotes from the book.

In a nutshell, the subject of this report deals with the ability of some stock traders to buy or sell a stock before others do. It deals with the speed of buying or selling. Here is an excerpt from the CBS program:

Steve Kroft: What's the headline here?

Michael Lewis: Stock market's rigged. The United States stock market, the most iconic market in global capitalism is rigged.

Steve Kroft: By whom?

Michael Lewis: By a combination of these stock exchanges, the big Wall Street banks and high-frequency traders.

Steve Kroft: Who are the victims?

Michael Lewis: Everybody who has an investment in the stock market.

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High-frequency traders, big Wall Street firms and stock exchanges have spent billions to gain an advantage of a millisecond for themselves and their customers, just to get a peek at stock market prices and orders a flash before everyone else, along with the opportunity to act on it.

Michael Lewis: The insiders are able to move faster than you. They're able to see your order and play it against other orders in ways that you don't understand. They're able to front run your order. [Writer, by say a few fractions of a second, such as .0001 seconds]

Steve Kroft: What do you mean front run?

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Michael Lewis: Means they're able to identify your desire to buy shares in Microsoft and buy 'em in front of you and sell 'em back to you at a higher price. It all happens in infinitesimally small periods of time. There's speed advantage that the faster traders have is milliseconds, some of it is fractions of milliseconds. But it's enough for them to identify what you're gonna do and do it before you do it at your expense.

Steve Kroft: So it drives the price up.

Michael Lewis: So it drives the price up, and in turn you pay a higher price.

Why aren't these front-run traders in jail? They are robbing ordinary investors. Because, as *60 Minutes* reveals, this form of trading is legal. This fact is a surprise to me. After all, the market is

being manipulated. Once again, as told in *The Nearly Perfect Storm*, the ordinary citizen gets the shaft, and the brokers apply it.

The solution was not provided by regulators. Some (ethical) traders have devised a method to have trades for customers arrive at around the various exchanges at the same time. Thus, the front run traders cannot exploit customers who are tied to an exchange that receive transactions more slowly because of transmission delays.

This solution came about because a geek or two knew the speed of light is 186,000 miles per second.¹ As said before, knowledge is the springboard to creativity.²

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The network engineers devised an amazingly simple solution. Because a stock trade would originate at a single site, the distance to the other exchanges (public and private) could be ascertained. Because electromagnetic (wire-based or wireless) and light (optical) signals travel at the speed of light (actually, very close to it on copper and the atmosphere and close to it on optical fiber), it was an easy matter to calculate how long it would take for a trade transaction to reach an exchange.³ By the way, the transmission channels under discussion are made of optical fiber, a medium for signals operating in the light spectrum.

Consequently, some of the network routes had delay introduced into them to assure a trade would arrive at the affected sites at close to the same time. Thus, the window of opportunity was closed for the front run traders to do their scamming.

But how can a light signal be delayed? By making it travel a longer distance. So, for a site that was located closer to the sending site, the trade (encoded in light signals) had to traverse more miles of optical fiber than a faraway site. The engineers simply wound the optical fiber connecting a close-in site around a spool until its overall length was the same as all the other locations.

Let's say a site was located in such a geographical position to others in this network such that the trade transaction had to be delayed just a split second, say, 0.001505376 seconds. That might seem like splitting hairs, but in the computing world the number actually represents a long delay. Computers operate at such fast rates and process data (say a stock trade) that a delay of 0.0001505376 seconds is considered a very long delay. Anyway, it would be a straight-forward task of wrapping 280 miles of fiber around a spool to achieve this delay.⁴

I have been working in electronic/optical communications networks since 1963 (I am now retired from this field). It did not take a technical wizard to come up with the *technical* solution to the high frequency trading scam. (Dealing with the exchanges, brokers, banks, and others was an immense task.)

¹ For signals that travel over optical fiber, the propagation speed is less because the light signals do not travel down the channel directly. They reflect and refract (bounce) through the medium.

² Attributed to Charlie Rose originally.

³ I say "easy" a bit loosely. Factors such as the number of intervening nodes (switches/routers/servers) that existed between the sender and receivers was a factor in calculating a delay time. But not a significant factor in comparison to the propagation delay on the physical channels themselves.

⁴ For simplicity, I am using the speed of light (186,000 miles per second). The reflecting of the signal inside the cable slows down the propagation delay.

Maybe so and maybe no. I read about this problem several years ago. In one of my last technical books, I wrote about using optical loops to simulate queuing delays in an optical switch. But I never thought of wrapping fiber around a spool to fix the problem covered here. Perhaps that is why I am retired, and the gentlemen who came up with this idea are wallowing in optical fiber and money. In my defense, I did not give the subject much thought. But in hindsight, I wish I had.

Addendum

High-Frequency Trading

High-frequency trading creates volatility in the marketplace. It gives the term *short* in short-term speculation a meaning beyond what many people can comprehend. It uses powerful computers to engage in millions of trades during a very short time, in mere seconds, more often, in fractions of seconds. Short term? Millions of dollars can be made by making trades and flipping stocks within a millisecond window.

Sometimes, it is even less. Nanosecond windows are not that big a deal when dealing with the speed of computers. Paraphrasing from Duhigg:⁵

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. In 1998, the SEC 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 execute millions of orders a second and scan dozens of marketplaces simultaneously. They can spot trends before other investors, changing orders and strategies within milliseconds.

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.

In addition, these traders can make a boatload of money just by trading, regardless if they lose or gain on the transaction. Stock exchanges pay a small fee to big volume traders. Spread over millions of shares, the income can be millions of dollars. Thus, the game is gamed to encourage even more frequent trades. Nice work if you can get it. In 2008, high-frequency traders turned a profit of about \$21 billion.

⁵ This general discussion is sourced: Charles Duhigg, "Stock Traders Find Speed Pays, in Milliseconds," *The New York Times*, July 23, 2009; Time's website