

# Professor proposes slowing down automated trading

By **Ameet Sachdev**, Tribune reporter

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**I**n an era of high-speed, automated trading, a big debate rages over how to keep markets safe after several technology-related snafus scarred investors. Instead of cracking down on high-speed traders, a [University of Chicago](#) economist says he has a better idea: Change the rules of the game.

In his research on futures trades made at lightning speeds — less than the blink of an eye — Eric Budish, an associate professor, found an unusual pattern. He examined the price movement of the two largest securities that track the Standard & Poor's 500 index. The prices moved in tandem, as he expected, except at very small time intervals — less than a second in length.

While humans can't process information that fast, state-of-the-art computers with preprogrammed trading instructions exploit the price differences between the two markets to make huge profits. This is what is known as arbitrage.

Budish argues that this type of arbitrage harms the markets by reducing liquidity. The only beneficiaries are those with the fastest computers and the fastest connections to the exchanges, leading to what he calls a high-speed trading "arms race."

"You are getting paid not for being smarter," Budish said. "You are getting paid for being ever so slightly faster than the next guy."

His analysis didn't end there. Budish asserts that profiting on pure speed is a sign of a flaw in the design of financial markets, not a gaming of the system. In most U.S. markets, trades occur on a continuous basis, except at the open and close of the trading day. In a continuous trading market, orders are processed one at a time, so the first in line wins.

The premium on speed drives the arms race, Budish said. High-frequency trading firms, for example, pay trading exchanges to locate their computers within the exchanges' data centers, seeking millisecond advantages. A millisecond is one-thousandth of a second.

Budish proposed a way to fix the flaw that he says would benefit all investors and end the arms race. He suggested that markets switch from continuous trading to frequent batch trading, which collects similar trades for a brief blind auction.

Discrete auctions in markets are not a new idea, but Budish's research has resonated in the markets because it's timely and brings an independent voice to a debate where there is little middle ground. He has been invited to

present his research at industry conferences and regulatory meetings. The reception has not always been pleasant.

At an event hosted by the [CME Group](#) in October, Leo Melamed, one of the pioneers of Chicago's financial futures markets, called Budish's proposal a "nonstarter." He said the markets are working pretty well and there's no need to fix something that isn't broken.

Otherwise, Melamed said jokingly, "I'm going to consider going to North Korea and show them how they can become the center of finance in about three weeks."

Not everyone is so dismissive about Budish's paper. A few weeks ago, New York Attorney General Eric Schneiderman cited his proposal in a speech calling out unfair practices by some high-frequency traders. He endorsed Budish's idea of frequent batch auctions as a "detailed and thoughtful proposal for reforms that would fundamentally reorient the markets in a very simple way that would help restore confidence in them."

These are heady times for Budish, 35, a native of New York who is helping shape the debate on important issues about the fairness and efficiency of equity and futures markets. He's only five years removed from receiving his Ph.D. at [Harvard University](#).

Budish is the lead author of the paper, working with Peter Cramton, a University of Maryland economics professor, and John Shim, a Ph.D. student at the University of Chicago. They are revising the 70-page paper for publication in an economics journal.

Although Budish has a serious demeanor, he doesn't come across as an intellectual snob. He's able to explain fairly complex topics in simple terms to make them accessible to the public.

He's unfazed by the public criticism of his work.

"I have a very thick skin," he said, something he credits to the University of Chicago's rigorous culture of debate.

While he has been painted as a critic of high-frequency trading, known as HFT, Budish said he's anything but. The University of Chicago funded his research.

"I'm an academic, an objective academic," he said. "I'm trying very hard to toe the middle ground."

Firms that employ high-speed trading strategies have gained a reputation as a disruptive force in the markets after some high-profile glitches. Nearly four years ago, on May 6, 2010, U.S. capital markets experienced the "flash crash," when the Dow Jones industrial average suffered a stunning 1,000-point loss in five minutes, followed by an equally dramatic recovery.

More recently, a technical error at the [Nasdaq](#) exchange delayed the start of trading for Facebook's initial public offering. The frequency of such incidents has brought increased scrutiny to HFT, which, according to some estimates, is responsible for about 50 percent of trading in the U.S. equities market.

High-frequency traders move rapidly in and out of stocks and commodities to capture fleeting shifts in prices. They say they reduce the cost of trading for all investors and make the markets more efficient.

But regulators are looking into technical concerns as well as other issues. Schneiderman said the incentive to be faster has led to unseemly practices among some high-frequency firms to obtain market-moving information ahead of other investors. It's different from traditional insider trading but just as unfair and potentially illegal, the attorney general said. For example, some firms pay a premium to get a consumer confidence survey a few seconds before it's released to the rest of the world.

The need for speed also has spurred expensive investments in telecommunications technology. In 2010, Spread Networks, a privately held company based in Mississippi, completed a fiber-optic connection between downtown Chicago, home of the CME Group's electronic trading platform, and exchange data centers in New Jersey. Spread Networks touts that its transmission line, estimated to cost \$300 million, is hundreds of miles shorter and milliseconds faster than other fiber-optic lines between the two trading centers.

Spread's ultrafast connection and the flash crash stirred Budish's curiosity in 2010. He is a student of a field of economics known as market design. The study of markets is much broader than the trading of stocks and bonds.

Academics have delved into how new doctors are matched with hospitals, students with schools and organ donors with patients. The goal of the research is to come up with rules of the market that produce good outcomes for participants.

For his dissertation, Budish studied how courses are allocated at Harvard Business School. One of his advisers was [Alvin Roth](#), winner of the 2012 [Nobel Memorial Prize in Economic Sciences](#). Since Budish joined the faculty at the U. of C.'s Booth School of Business in 2009, his research has been eclectic, ranging from auctions for event tickets to the patent system.

Budish examined the HFT arms race by asking whether continuous trading is the right design, sidestepping the debate about whether high-speed trading is good or evil.

"There's a lot of noise in the discussion of high-frequency trading," Budish said.

Budish and his co-authors first conducted an experiment. They gathered millisecond-level data for seven years from the CME Group and the New York Stock Exchange. The CME trades the E-mini S&P; 500 index futures contract, while the NYSE has an exchange-traded fund that corresponds to the index.

After finding the temporary price discrepancies, the researchers calculated there are, on average, about 800 arbitrage opportunities per day in these securities worth about \$75 million in annual profit. This trade is just the tip of the iceberg. Billions of dollars are at stake in other such trading opportunities, Budish estimated.

Competition usually eliminates the trading opportunities, Budish said. But their research showed that competition among computer-driven trading firms did not reduce the frequency of arbitrage opportunities, and only increased the speed requirements for capturing the profits.

"In the extremely short run, the markets are not efficient," Budish said. "That inefficiency is built into the design."

By moving to an auction system conducted every second, traders would have to compete on price instead of speed, Budish said.

With so much money at stake, proponents of high-speed trading are picking apart Budish's research. Some argue there's nothing wrong with computers fighting each other.

"Speed is not a weapon," said Peter Nabicht, a spokesman for Modern Markets Initiative, an HFT trade group. "Speed is a tool that allows you to accurately price contracts."

Budish counters that the profits computer-driven firms are making from the arms race ultimately come from real investors. His interest is in making the markets work better.

"I hope I'm bringing some rationality to the debate," he said. "I'm very proud of the reception it has gotten."

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