How automated trades compounded yesterday's surprise stock sell-off

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No one knows for sure yet why the stock market briefly collapsed on Thursday over the course of a few terrifying minutes. But everyone seems to agree that human beings didn't have too much to do with it.

Instead, the prime force behind the enormous and rapid sell-off was apparently the automated computer systems that financial institutions use to make trades on the market without human input. According to the best estimates, as much as 70 percent of the total trading volume in securities flows through these systems. Many such trades are just computers executing commands on behalf of brokers, but as many as a third consist of computers actually deciding without human input whether to buy or sell a security.

They are, in essence, robots with money — a far cry from the frantic, chain-smoking floor traders who have long symbolized the business of Wall Street in the popular mind. Usually, these are very efficient robots, executing trades in the span of microseconds and making a tidy profit on barely perceptible inefficiencies in the market. But sometimes they go haywire, as computers are wont to, and now Congress and the SEC are looking into the episode and wondering whether it makes sense to hand two-thirds of our daily trading activity over to HAL 9000.

The system's apparent malfunction certainly created its share of nonsensical havoc yesterday. Some marquee stocks went down to irrationally low prices — someone sold 30,000 shares of Accenture for one penny a share at 2:48 p.m.; two minutes on either side of that it was trading at $39.

The spark of yesterday's sell-off is still unknown, but some reports peg it to human error — a trader who allegedly put up 16 billion shares of a stock for sale when he meant to sell 16 million. According to New York Times reporters Nelson D. Schwartz and Louise Story, the mistake apparently emanated from Chicago. Overseers of the major exchanges "identified 'a huge, anomalous, unexplained surge in selling, it looks like in Chicago,' " a source close to the official review of the sell-off told the Times. From there, the automated system went into overdrive, Schwartz and Story noted: "That jolt apparently set off trading based on computer algorithms, which in turn rippled across indexes and spiraled out of control."
When humans are in charge of buying and selling stocks, and are operating on a human time scale, they're able to look at such a transaction and wonder if something's gone awry. But the automated trading systems that dominate the markets appear to have simply taken over within milliseconds, briefly erasing billions of dollars in wealth and deeply cutting the value of the shares of Apple and Proctor & Gamble, chiefly because their algorithms told them to.

"This is just the tip of the iceberg," Benjamin Van Vliet, a professor at the Illinois Institute of Technology's Stuart School of Business and an expert in automated trading, told Yahoo! News. "The problem is that the computer systems that generate these trades are designed by traders or finance people who have never taken a class in software quality control. People are talking about how there's fear of a 'glitch' in the system. But when you get on a plane, are you scared of a glitch in the airplane's software? The people building aviation software understand that your real-time system can never fail. In finance, these people haven't learned that."

Some experts dispute that characterization. When Yahoo! News asked Terry Hendershott, a professor at the Haas School of Business at the University of California-Berkeley, whether a computer generated a particularly out-of-kilter trade, he replied that "the people I know who write these computer programs, they're not nearly that dumb."

Bernard S. Donefer, a professor of business at Baruch College at the City University of New York, recently wrote an impeccably timed paper predicting almost precisely what seems to have happened yesterday for the spring issue of the Journal of Trading:

Picture this: a trader with a large order executes an algorithmic strategy, either from his broker or proprietary to his own firm. It has a bug.... Operating on incorrect information, its trades are routed to 10 or more light and dark markets searching for liquidity. Like a dog chasing its tail, it moves the [price], canceling and correcting itself to adapt to the new self-created market conditions.... A decade ago, regulators might see this activity as coming from a single source, a single fat-fingered trade, but now we just see many small orders across multiple markets. Is it "smart money" — does someone know something? Keynes' animal spirits take over and the herd charges, and in doing so, the contagion spreads to related assets and derivatives, reinforcing the panic.

Donefer's paper reviewed a host of previous instances when automated trading moved markets based on errors that humans might have understood but computers didn't catch. In 2008, an outdated headline about United Airlines going into bankruptcy mistakenly crossed the wires, sending United's stock down from $12 to $3. "Actual people may not have been fooled by the incorrect headline," he wrote, "but computer models took over the trading in UAL."

Donefer told Yahoo! News that he didn't have sufficient information about what happened yesterday to say whether it matched his nightmare scenario. But he says we're overdue for a regulatory scheme that addresses the possibility that automated trading can take over the markets. "We need more information," he says. "I'd like to see high-frequency trading funds" — hedge funds that execute high-volume trades in microseconds in order to make money from tiny price differences — "tagged by strategy, so we know what they're doing. We need to start gathering statistics for the regulators. Then we can make a plan."
Of course, not everyone sees the automated trading setup as a bad thing. "Most of the big mistakes we see in financial markets have been made by humans," Hendershott says. "This sort of volatility isn't good, but if the price is wrong for a millisecond, who exactly is hurt?"

Hendershott says he wants regulators to get to the bottom of what happened, but that the harm wasn't that bad, since most of the out-of-whack trades will be canceled anyway. "Let's say it was a computer saying, 'Sell, sell, sell, sell,' driving down the market. Did the company make money? If it was a screwup and they did it unintentionally, they won't do it again — they'll probably go out of business. But if they did it intentionally, then we have a big problem."

What's more, he says, it was likely computer trading that stabilized the market so quickly after the drop. "This is what we call transitory volatility. It lasted seconds. Yet in 1987, when Black Monday happened, you had a lot more humans involved, and it lasted days."

— John Cook is the senior national affairs reporter/blogger for Yahoo! News.