**THE FLASH CRASH: MACHINES GONE WILD?**

On May 6, 2010, the U.S. stock markets were already down and trending even lower. Concerns about European debt, primarily the possibility of Greece defaulting, added to exhibiting investor uncertainties about the markets and the economy at that time. But at 2:42 PM, in a flash, the equity market took. a plunge so fast and so deep that it could not have been motivated by investor uncertainty alone.

Before the plunge, the market was already down 300 points on the day. In less than five minutes after 2:42, the Dow Jones Industrial Average plummeted more than 600 points, representing a loss of $1 trillion in market value. At its lowest point, the Dow was down a whopping 998.50 points to 9869.62, a 9.2 percent drop from the day's opening. This represented the biggest intraday decline in Dow history. Fortunately, this loss was temporary, vanishing nearly as quickly as it appeared. By 3:07 PM, the market had already regained nearly all of the points it had lost, and eventually closed down just 347.80 points that day at 10,520.32. The hefty loss was still its worst Dow percentage decline in over a year, but it certainly could have been worse.

How could this “flash crash” have happened? It now appears that the abrupt selling activities of a single mutual fund company touched off a chain reaction. A confluence of forces was unleashed by the structural and organizational features of the electronic trading systems that execute the majority of trades on the Dow and the rest of the world's major stock exchanges. Electronic trading systems offer considerable advantages over human brokers, including speed, reduced cost, and more liquid markets. High-frequency traders (HFTs) have taken over many of the responsibilities once filled by stock exchange specialists and market makers whose job was to match buyers and sellers efficiently.

Many trading systems today, such as those used by HFTs, are automated, using algorithms to place their nearly instant trades. A number of the HFT trading firms and hedge funds now use machine learning to help their computer systems trade in and out of stocks efficiently. Machine learning programs are able to crunch vast amounts of data in short periods, "learn” what works, and adjust their stock trading strategies on the fly, based on shifting dynamics in the market and broader economy. This method is far beyond human capability: As Michael Kearns, computer science professor at University of Pennsylvania and expert in AI investing, stated, "No human could do this. Your head would blow off.” It would appear, however, in situations like the flash crash, where a computer algorithm is insufficient to handle the complexity of the event in progress, electronic trading systems have the potential to make a bad situation much worse.

At 2:3.2 P.M. on May 6, Waddell & Reed Financial of Overland Park, Kansas started to sell $4.1billion of futures contract8 using a computer selling algorithm that dumped 75,000 contracts onto the market over the next 20 minutes. Normally, a sale of that size would take as much as five hours, but on that day, it was executed in 20 minutes. The algorithm instructed computers to execute the trade without regard to price or time, and thus continued to sell as prices sharply dropped.

After Waddell & Reed started to sell, many of the futures contracts were bought by HFTs. As the HFTs realized prices were continuing to fall, they began to sell what they had just bought very aggressively, which caused the mutual fund's algorithm in turn to accelerate its selling. The HFT computers traded contracts back and forth, creating a “hot potato” effect. The selling pressure was then transferred from the futures market to the stock market. Frightened buyers pulled to the sidelines. The markets were overwhelmed by sell orders with no legitimate buyers available to meet those orders.

The only buy orders available at all originated from automated systems, which were submitting orders known as “stub quotes.” Stub quotes are offers to buy stocks at prices so low that they are unlikely to ever be the sole buyers of that stock available; during the unique conditions of the flash crash, they were. When the only offer to buy available is a penny-priced stub quote, a market order by its terms, will execute against the stub quote. In this respect, automated trading systems will follow their coded logic regardless of outcome, while human involvement would likely have prevented these orders from executing at absurd prices.

In the midst of the crisis, the New York Stock Exchange activated circuit breakers, measures intended to slow trading on stocks that have lost a tenth or more of their value in a short time, and routed all of their trading traffic to human brokers in an effort to stop the downward spiral. (NYSE is the only m or exchange with the ability to execute trades both via computers and via human brokers.) But because of the enormous volume of orders, and because other fully electronic exchanges lacked similar circuit breakers, it may have had the reverse effect in the short term. While computerized systems simply continued to push the market lower, humans were unable to react fast enough to the situation.

Regulators are considering several different approaches to preventing future flash crashes, but it may be that there is no satisfactory solution. The Securities and Exchange Commission (SEC) may attempt tn standardize circuit breakers acro5s all financial markets, limit high-frequency trading, overhaul the stub quoting system, or stipulate that all buy and sell orders be limit orders, which places upper and lower limits on the prices at which stocks can be bought and sold. But it may be that events like the flash crash are what author and hedge fund adviser Nassim Uleb called “Black Swans” in his book of the same name-unpredictable and uncontrollable events under which we only have "the illusion of control.”

After 'Black Monday' in1987, the last crash of similar size, it was thought that computer trading prevented sudden drops in the market, but the flash crash indicates that electronic trading simply allows them to occur over a shorter time period, and may even magnify these sudden market moves in either direction because they can happen faster with less chance of intervention. But, as the flash crash has proven, if we rely solely on these automated methods of electronic trading, we'll still need to worry about machines gone wild.

**CASE STUDY QUESTIONS**

1. Describe the conditions that preceded the flash crash.

Z. What are some of the benefits of electronic trading?

3. What features of electronic trading and automated trading programs contributed to the crash?

4. Could this crash have been prevented? Why or why not?