The Dangers of Automated Transactions

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The two of us have recently been turned on to a story about a textbook. As the story goes, two companies implemented two very stupid automated pricing algorithms: the first set its price by multiplying the second's price by 0.9983, and the second set its price by multiplying the first's price by 1.27059. What's scarier is that nobody bothered to check these prices, and keep them in check, until the prices were greater than $23 million.

This particular algorithm resulted in minimal disaster: all that happened was that a price became totally unreasonable, people couldn't buy the textbook from a particular source, and could-be value from particular transactions was lost. But it's not hard to imagine algorithms only slightly more stupid resulting in much bigger problems.

What if actor A, an automated buyer, bought, and borrowed to buy, and kept buying, as long as the price was below $1.00. And actor B, also automated, sold, and sold short, and kept selling, as long as the price was above $0.90. The smaller of the two companies would quickly crumble under the transaction fees. And for whatever time they spent trading, the market would fluctuate in odd, volatile ways that could result in, for example, a flash crash.

While the hypothetical situation above is a little extreme, automated trading could already be resulting in — or at least exacerbating — such flash crashes. The

Flash Crash on May 6 2010 — also known, humorously, as “The Crash of 2:45,” — resulted in a temporary plummet of the Dow Jones Industrial Average by about 1000 points, roughly 9% of its value (Lauricella and McKay 2010) (Twin 2010). Proctor & Gamble’s shares, particularly, went down by 37% before rebounding back up to where they were.

Sources argue about how relevant the High Frequency Traders were to the Flash Crash. One source argues that the effect of the High Frequency Traders on the crash was much less than others thought. This is due to the fact that, while 16 traders accounted for about a third of the trading, these traders were mostly fluctuating around 0 stock, and at no point had the raw inventory to make a very big impact (Kirilenko et al. 2010). Not that they needed to — many argue one large sale of “E-Minis,” smaller versions of the S&P 500 contract, triggered all of the automated traders to start selling at once, which, combined with the fluctuations from their high-frequency low-inventory trades, may have been the set of events that led to the crash (Rooney 2010). Even if the High Fequency Traders were not the cause of the crash, the price would not have dipped as much if not for these traders.

Some, though, argue that the reactive nature of some of these algorithms may have minimized the harm, particularly helping in the quick rebound, comparing the Flash Crash to past, less temporary crashes (Corkery 2010). Others still, argue the value of algorithms on other bases.

This wide range of opinions, taken as a whole, however, seems to echo a negative sentiment about automated trading and pricing: the amount of trading they can do very suddenly, and without human control, is, in current markets, simply

dangerous. More dangerous than it is worth to the economy.

Those implementing the algorithms face some danger as well. In the case of one company, it meant absolute disaster: " . . . in 2003 a U.S. trading firm became insolvent in 16 seconds when an employee who had no involvement with algorithms switched one on. It took the company 47 minutes to realize it had gone bust and to call its clearing bank, which was unaware of the situation" (Clark 2010). These extreme dangers will hopefully scare most traders away from automated trading.

Sadly, it is not necessarily more dangerous to those implementing the algorithms than it is worth to them. Since many individuals stand to make a profit on a good trading algorithm, many of those individuals will do so — even if they damage the entire economy in the process. What's more, this automation is a means of gaming the system. It is generally not a good thing when individuals derive value, not from hard work or good ideas, but simply from opportunization — and, as this is all these bots do, they only suck value out of the system, and give it to those who are undeserving.

Perhaps more dangerous to our morals is the fact that trading bots have none to speak of. Where, in the past, even the most opportunistic of traders might avoid, say, cigarette companies and oil conglomerates — even just a little — trading bots will not be coded to have any such qualms. When faced with the decision to buy or sell, a human will consider the impact of his decision. But when coding, no human is going to implement an algorithm that says:

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if ( isCuttingDownRainforest( HP ) )
{ boycott(); }
```

else

{ buybuybuy() }

As a matter of fact, it seems more likely that the maximizeProfit() function will be called immediately every time. This, again, causes us some dread. Without people to trade based on things *other than profit potential*, there is little hope that, say, for example, cigarette companies will die a slow death, as people realize their evils, as was once hoped. Rather, they will continue to sell stock as long as they can make a profit, and will continue to make a profit as long as they are allowed to sell addictive drugs to people — without government intervention, the only thing that might stop them would be that mysteriously elusive social education platform that actually conveys the dangers of cigarettes to people.

An article we found sums the problem up in an interesting way; the Ethical Consistency Problem (Turilli 2007) challenges us to make beings without semantic understanding — such as purchasing algorithms — function consistently with beings that do have semantic understanding — particularly, people.

They propose a solution. Given a set of ethical principles (good luck, Philosophers):

> "1. Translating the normative constraints expressed by the given ethical principles into terms of ethical requirements. An ethical requirement constrains the functionalities of a computational system, thus guaranteeing that one or more properties are maintained during its execution;
>
> 2. translating the ethical requirements into an ethical protocol. An ethical protocol specifies the operations performed by the system so that their behaviours match the condition posed by the ethical requirements;

3. refining the specification of the system into executable algorithms."

This solution, of course, is easier stated than implemented. However, if successful, it would, at the very least, function for our programs like laws do for us; as the paper shows in figure 1, our programs would be ethically constrained in much the same ways that laws, policies, and codes of ethics constrain us. But alas, it would take something much more complicated — something most programmers would not bother making — to grant our programs something like a *conscience*.

Automatic trading may even make it more difficult for humans to regulate themselves in these markets; even the structure of a system that allows people to trade algorithmically separates people who run the trading system from those trading in it (Domowitz and Lee 1996). Without the requirement of interaction between the managers of the market and its end users, the managers will be less able to regulate the system reasonably.

It seems like such an end, however, may be out of our reach. High Frequency trading is on the rise (Cui and Lauricella 2011), and is likely to continue to rise as long as the profit potential is there. I have some hope in that the automatic stock trading volumes have gone down, but it will take a lot more than scary events like the 23-million dollar textbook or the Flash Crash to curb peoples' appetites for automatic selling. Perhaps programmers have more potential to resist the urge of profit than their business-oriented counterparts, and thus can thus learn to contain themselves, and stand as a barrier to this evil. But as far as such a moral stand goes, I don't see it happening any time soon.

The SEC, thankfully, is at least working on regulation. They have proposed

various restrictions to limitations in the speed of trading and price fluctuation, including, but not limited to, “[setting] a minimum trading speed, [requiring] a minimum amount of time that a trader must maintain a quote, and [requiring] exchanges to batch process their trades.” (Cardella, Hao, and Kalcheva 2010). While I feel that these don’t quite meet the level of regulation necessary to make this system viable, it is a step in the right direction. However, the SEC has had a history of trouble with such regulation. (Domowitz and Lee 1996) We can now only hope that the necessary regulation comes soon, and in a fast, responsible, fair, and effective way.

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