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Abstract

This paper discusses the market manipulation strategy using the “cancel if close to market” order. Specifically, we question whether this type of “market spoofing” is capable of causing a highly volatile event such as the Flesh Crash of 2010. We conclude that under normal market conditions, the market manipulation using the “cancel if close to market” order can actually improve the market efficiency because it interferes with front-running. Nevertheless, under the conditions of severe market stress and reduced liquidity, “market spoofing” can be a catalyst to a significant stock market crash.

Keywords: market spoofing; cancel if close to market; flash crash

It took regulators almost five years to bring the formal charges against anybody directly responsible for the Flash Crash of May 6, 2010. The 36-year old individual trader working out of his parents' house in suburban London was arrested in April of 2015 for allegedly being "at least significantly responsible" for the 10-minute US stock market crash, during which the S&P 500 lost over 9%, and subsequently recovered most of the losses. Apparently, this individual trader accounted for 20%-29% of all sell orders in S&P 500 futures at certain point during the Flash Crash. More importantly, these orders were replaced or modified 19000 times during the day and subsequently all canceled before the market closed – thus never filled! As a result, regulators allege that this individual trader caused the significant imbalance in buy/sell orders by engaging in essentially what could be described as "market spoofing" – entering the sell orders without the intention to actually ever fill these orders, which significantly contributed to the Flash Crash and exposed serious weaknesses in the stock market microstructure with severe systematic risk consequences. In fact, the evidence emerged that this trader modified his generic trading software to specifically allow the placement of "cancel if close to market" orders. Such a modification apparently produced a successful trading strategy which netted over $40 million in trading profits over time, including nearly $1 million during the Flash Crash.

Yet, many questions remain unanswered. What is the exact nature of these "cancel if close to market" order? If these orders are in fact predatory, who is the targeted prey or the victim? Further, do these orders really capable of causing the stock market crash, such as the 2010 Flash Crash, and if yes, under which conditions? But before discussing these questions, it's important to understand other types of orders and, generally, the market microstructure.

Market orders and liquidity

Most long-term investors, when either buying or selling stocks, simply enter so called "market orders", which are filled almost instantaneously at best available ask or bid prices. It is very important for well-functioning markets to ensure deep market liquidity, or the ability of buyers to quickly buy (or sellers to quickly sell) the desired quantity of shares. Thus, general investors interact with liquidity providers or market-makers who buy whenever someone wants to sell and sell whenever someone wants to buy. These liquidity-providing market makers can be defined as short term speculators, whose trading model is generally a function of the bid-ask spread – buy at the bid and sell at the ask. Further, given that each of these individual trades has only a razor thin profit potential; these liquidity providers are forced to execute high quantity of trades to ensure any meaningful profits. Thus, some define them as "high frequency traders", which should not have any negative connotations. To emphasize, these speculators (market-makers) are liquidity providers, and thus, very important for well-functioning markets.

Competitive Limit orders and required flexibility

Further, in order to ensure their trading profits (buy at the bid – sell at the ask), market makers are forced to enter "limit orders", in which they specify the exact price at which they buy (the bid), and sell (the ask), as well as the quantity of shares buying or selling. These limit orders on aggregate are highly competitive and regular investors generally fill their market orders at the highest bid and the lower ask at any given time, as we previously stated. Thus, market makers must have the flexibility to quickly cancel and replace their orders to remain competitive and also to ensure profitability. Specifically, a limit order once placed,

immediately becomes an open order, or a working order, and all trading platforms have the function (or the button) that allows to manually cancel the order or to replace the order with the new specifications. Thus, in order to explain the controversial "cancel if close to market" order, it is important to further explain why market makers cancel (and replace) their limit orders.

Specifically, the trading algorithm employed by market makers heavily depends on the two observable market variables: the price pattern, and the volume pattern. For example, a market maker with an open limit order to buy a stock observes a short term pattern of falling prices, and accordingly cancels the open bid and possibly replaces it with the new lower bid, anticipating even lower prices. Similarly, a market maker might observe a very large sell order, and accordingly cancels the bid anticipating the selling pressure which could send prices lower. To repeat, a limit order can be fully canceled (or canceled and replaced) by manually clicking the button in any trading platform.

What is the "cancel if close to market" order?

Apparently, the individual trader accused for significantly contributing to the 2010 Flash Crash specifically requested from the software provider to modify his generic trading software to make it possible to enter the limit order with the ability to specify the condition under which the limit order can be automatically cancelled (without the need to manually click the button). Further, the accused trader was not placing these custom made orders competitively, as the specified limit price was distant from the best ask (or bid) price. Finally, the trader would specify that the limit order becomes automatically canceled when the market price moves close the specified limit price, within the certain distance. Thus, it is obvious that such order is designed never to be filled – as soon as the market price comes close to the limit

price, the order is canceled. Thus, the "cancel if close to market" is simply the limit order with the set condition under which the order is automatically canceled. The specifications and the implied strategy embedded in the "cancel if close to market" order clearly distinguishes the accused trader from the regular market-maker.

How the "cancel if close to market" order is *allegedly* used to manipulate the markets?

The "cancel if close to market" order is manipulative by default, since it's specifically designed never to be filled. According to the media, the trader who apparently used this order to earn significant and consistent trading profits over time (and allegedly caused the Flash Crash of 2010), would enter the limit order to sell extraordinarily high quantity of S&P E-Mini futures, at the limit price distant from the best ask, with the instruction to automatically cancel the order should the price of S&P 500 increase. For example, assume that the lowest ask is 1000.60 for 30 contracts, and the trader enters the order to sell 50000 contracts at 1003 (see Table 1), with the instruction to automatically cancel the order if price reaches 1001.50. In this scenario, the market makers on the bid side (buyers) interpret the extraordinarily high quantity of contracts to be sold (50000) as the supply/demand order imbalance and, consequently, anticipate the selling pressure unable to be absorb by the current bids. As a result, the market makers remove their limit order bids until some clarity emerges, which causes temporarily illiquid market. At this time, any market order is filled at a much lower price, causing the dip in the price. The manipulating trader now buys the dip and removes the order to sell 50000 contracts, which essentially brings back the market makers with their regular bids, and as the price recovers, the trader sells at a higher price for profit. The "automatic cancel" feature of the trade is essentially the risk management tool to ensure that the order is never filled, should the price move higher. Also, the "automatic" feature provides the trader with the lighting speed to adjust the position, by bypassing the manual procedure.

Clearly, the "cancel if close to market" order is predatory, specifically designed to create the artificial dip in price to allow the predator to buy at a lower price and sell when the price recovers. However, it remains unclear who, in fact, is the intended victim or the prey. Normally, any market participant that sells during the artificial dip is a victim as it gets filled at the artificially lower price, especially regular investors placing market orders. Nevertheless, it is difficult to point to any particular market participant as the specific intended target, which makes us question the validity of alleged market manipulation, as currently understood.

More importantly, we see some serious flows in the feasibility of the previously explained strategy to manipulate markets and *consistently* make trading profits. Affirmatively, the market makers on the bid side might *occasionally* withdraw their bids when they notice a large overhanging order to sell, until some clarity appears. However, if these large overhanging orders are consistently canceled, the market makers are likely to learn to ignore such orders as "market spoofing". In fact, many traders acknowledge that so called "market spoofing" regularly occurs even if physical trading pits, and are normally ignored. Thus, given that market markets are aware of "fake orders" and "market spoofing", their trading algorithms might be more inclined to focus on the actual price patterns, with a more complex volume pattern analysis. As a result, a "fake sell" order with heavy quantity is unlikely to consistently cause the market makers to remove their bids and cause market illiquidity. Thus, the market makers cannot be the direct target of "market spoofing" and, in fact, a more complex analysis of market microstructure is necessary to fully understand the market impact of "cancel if close to market" orders.

Table 1: Order Book

		1003.00 (50000)	ASK (sell)
		…..	
		1001.00 (100)	
		1000.90 (60)	
Best Bid	**1000.20 (50)**	**1000.60 (30)**	**Best Ask**
	1000.00 (300)		
	999.90 (50)		
	999.50 (100)		
BID (buy)	999.20 (70)		

Front running vs market spoofing

The literature on speculation and market manipulation such as Delong et al. (1990), Attari et al. (2005), Brunnermeier and Pedersen (2005), and Carlin et al. (2007), and Angel and McCabe (2010), suggests that any predatory trading model has to have at least one of these two characteristics, if not both, to ensure consistent predatory trading profits: 1) understanding the predictable trading strategy of the victim; and 2) superior information about the forced (or automatic) trade executions by the victim.

The predator, which Delong et al. (1990) defined as a rational speculator, knows that many traders behave as trend-followers (or the positive feedback traders) and, thus, have the highly predictable trading strategy - buy when prices are rising and sell when prices are falling, irrespective of any fundamental justifications. Thus, the predator can manipulate the dip in the price by simply creating an artificial trend of falling prices to induce more selling by trend

followers. Once the selling by the trend-followers is exhausted, the predator buys, and consequently sells when the price recovers. Within this model of market manipulation, the victims are clearly the noise traders behaving as the positive-feedback traders. It is important to distinguish between the market makers, who attempt to profit from the bid-ask spread, and the positive feedback traders, who attempt to profit from the short-term price trends.

The predator also possesses superior information about the open orders and the financial conditions of other market participants, Attari et al. (2005). For example, a rational arbitrageur might identify a fundamental situation where the market is temporally undervalued and, thus, buys the market using the significant margin inherited in the futures contracts. Also, as a risk management tool, the arbitrageur enters the stop-loss order in case the price falls further. The predator has knowledge of these open stop-loss orders, and artificially moves the price lower, possibly aided by the positive feedback traders, to the point where the arbitrageur's stop-loss order is automatically executed. Within this model of market manipulation, the rational arbitrageur is the primary victim or prey.

The most notorious model of market manipulation involves what broadly can be defined as "front-running". Within this predatory strategy, the predator looks for a financially vulnerable victim that is forced to exit the position due to a margin call. For example, a stubborn arbitrageur who fails to realize the market manipulation might increase the long position as prices fall, possibly using even more margin. Eventually, such arbitrageur receives the margin call, and it's forced to immediately exit the position. The same situation applies even to trend-followers who fail to realize that the trend has changed, and consequently receive the margin call as their equity gets depleted. Certain predators might have the superior information about the financial conditions of the victim. However, most less informed predators have to look for the signals about the forced sales. Undoubtedly, a large sell order that appears usually near the end of the trading day clearly fits the definition of a forced sale due to a margin call. Thus, the

predator aggressively sells before the large order is executed to dry-up the liquidly (as previously explained), which causes the significant dip in the price when the large order gets filled. After the forced sale is executed, the predator buys the dip, and sells when the price eventually recovers. In fact, front-running does not have to occur only with forced sales. Any large sale order presents an opportunity for front-running, and even the smaller orders can be targeted during pre-market, post-market, holidays, or other low liquidity periods, as well as less liquid assets.

Clearly, the "cancel if close to market" order interferes with front-running, as previously defined. The individual trader who allegedly caused the Flash Crash of 2010, had been, in fact "spoofing" with these notorious predators (front-runners), and consistently had beaten them at their own game. How? The accused trader would enter a large "fake" order to sell, which front-runners would possibly interpret as a forced sale, and thus, aggressively sell in anticipation of the forced sale order execution. The trader would subsequently buy the dip caused by the front-runners and cancel the fake order. At this point, the front-runners would realize that there were "spoofed" and scramble to offset their short position at a higher price, which is when the trader sells for profit. More interestingly, the front-runner is unable to predate on the market spoofer, because the fake order is automatically cancelled as the price increases. Within this model of market speculation, the frontrunners are the main victims of market spoofing and possibly the intended prey. Thus, we acknowledge that the "cancel if close to market" is clearly predatory, and thus illegal. However, since the main victim is even a more notorious predator, this type of market manipulation might in fact be beneficial to the market efficiency, as it neutralizes the broadly harmful front-running activity. The question remains, then, how could possibly the individual trader engaged in "market spoofing" cause or significantly contribute to the Flash Crash of 2010?

What likely caused the Flash Crash of 2010?

Apparently, the individual trader accused for causing the Flash Crash of 2010 made over $40 million over time by consistently market spoofing with "cancel if close to market" orders, and yet, the Flash Crash type of price reaction occurred only once, on May 6, 2010. Thus, "market spoofing" alone cannot possibly be the cause of the Flash Crash. So, what was different on that day to produce such a volatile market reaction? Some even speculate that the Flash Crash was just a random technical glitch, in which case no trader can be particularly blamed. However, these are the facts as reported by the media that might offer some clues:

- The market opened lower on May 6th, 2010 reportedly due to the heighten anxiety over the Greek situation. Further, the markets had been volatile leading to the Flash Crash due to the Greek default fears, which increased the chance of forced sales due, as there were widespread distressed assets especially in the peripheral Euro bond markets.
- Exactly at 2:30pm on May 6th, 2010 a mutual firm Waddell & Reed entered a very large order to sell 75000 contracts of S&P 500 futures, worth $4.1 billion. The timing of the trade coincides with the forced sale due to a margin call, since it has been placed just before the market close. (The firm afterwards explained that the large order was simply a short hedge.)
- At the same time, it appears that the accused individual trader was engaged in heavy "market spoofing", whose fake sell orders accounted for around 29% of all sell orders on S&P 500 E-mini futures.
- We assume that front-runners "took the swing" at the large order by Waddell & Reed, and this time "hit the homerun". Once market makers realized that there was, in fact, a real sell order, not just "market spoofing", they withdrew their bids, which caused market to become illiquid. Further, any sell order at this time had to be taken

seriously, and market makers were not willing to differentiate between the real orders and fake sell orders, Thus, given the quantity of fake order (up to 29% of all sell orders) the accused individual trader probably significantly contributed to the Flash Crash.

- Eventually, once the order by Waddell & Reed was filled, the market makers realized that there were no other similar real sell orders, and the market rebounded into the close, erasing most of the losses.

Jury on the "cancel if close to market" order

The "cancel if close to market" order is no doubt predatory, which is easy to prove since it's specifically designed never to be filled. However, the trading strategy using such an order is unlikely to cause anything more than a minor dip in price under normal conditions, which might be sufficient to earn significant trading profits, but highly insignificant with respect to broader market efficiency. In fact, the intended victim of market spoofing is a more notorious market predator known as a front-runner. Thus, given that market spoofing directly interferes with front-running, and assuming that at least modestly deters front-running, it is actually beneficial for the overall market efficiency under the normal conditions. However, under the specific conditions of reduced market liquidity and overhanging supply of "real sell orders", "market spoofing" can be a catalyst to an extreme market volatility, such as the Flash Crash of 2010.

However, it is important to understand "market spoofing" within the context of a zero-sum trading game, which is inherited in futures trading. Specifically, a trader can only win if another trader losses. Thus, traders are forced to compete using "trading strategies" which (in some way) have to be predatory, at least to a certain degree. Hence, it appears that regulators understand the predatory nature of the zero-sum trading game and actually tolerate many

"grey-area activities", providing that the net effect of the trading game is reflected in a deeper market liquidity, and any price volatility is limited to short term noise. In fact, long-term investors have been trained to treat the short term price movements as unpredictable noise, and largely to ignore it. However, the regulators seem to interfere in the trading game only after the crashes and other highly volatile events that potentially have systematic consequences, spread to the real economy, and affect the confidence of long-term investors (such as the Flash Crash of 2010 and the Oil Bubble of 2008). Specifically, the concern is how the trading game evolves, and whether any innovations or new entrants increase the risk of the system break-down. The public has been introduced to the "cancel if close to market" order first time with the reference to the individual trader arrested for the Flash Cash. However, it is likely that other traders have been modifying their trading platform to execute automatic cancel orders, and a variety of other currently unknown modification. So, should regulators now be concerned about these innovations? The recent market performance and the generally low volatility would suggests otherwise. However, regulators should always stay on high alert for "greedy traders", irrespective of their trading strategies. The most striking fact about the trader arrested in relation to the Flash Crash is the fact that an individual *was allowed* to be responsible for up to 29% of all sell orders in a single day! What would happen if other traders try to replicate this enormously large exposure to make easy profit? Thus, rather that regulating specific trading strategies, regulators should focus on limiting the market impact of any individual trader (using any strategy) via position limits.

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