Drowning in Data

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Quantitative Execution Services

(416) 359-5743
qes@bmo.com

Doug Clark
(416) 359-4151
doug.clark@bmo.com

Rizwan Awan, CFA
(416) 359-5195
rizwan.awan@bmo.com

Jeremy Dietrich
(416) 359-5692
jeremy.dietrich@bmo.com

Andrew Ng
(416) 359-8692
andrew.ng@bmo.com

Andrew Karsgaard
(416) 359-7670
andrew.karsgaard@bmo.com

Introduction

Much has already been written about the "Flash Crash" of May 6th, 2010. Trading venues, dealers and the SEC have all put out papers proposing explanations for the sudden market meltdown. While many of these papers have made some excellent points, we are both surprised and disappointed that nobody has discussed the data deluge that almost certainly contributed to the day's action. This paper will take a look at the effect that a tsunami of market data may have had on the marketplace, and will examine how likely it is that a similar tsunami overwhelms the Canadian markets in the near future.

Flash Crash Prologue

Coming into the day on May 6th, the market had plenty to be nervous about - the Greek bailout, European sovereign debt issues, the BP oil spill, and an uncertain UK election result to name the most obvious. The market had been trading down for 2 days and continued trading down that day. By 2 pm the broad based averages were down almost 3%. The volatility index was rising sharply and market volumes were very strong.

From 2pm until 2:40 pm the market continued to move lower with increasing speed. And then at 2:40 pm the bottom fell out and within a 5 minute period the broad based indices had lost 5% and several stocks had traded at levels more than 60% below their 2 pm price. Most of the papers we have read on the crash discuss what happened at 2:40 pm. We think what happened at 2:37 pm is far more interesting.

At approx 2:37 pm both Nasdaq marketplaces – Nasdaq and Nasdaq OMX BX – declared "Self Help" against NYSE Arca. At the same time several market participants we have talked to started to experience slowness in data and order confirmation from Arca. As order flow started routing away from Arca, participants started experiencing similar delays from other trading venues. (Both Citadel and Knight Capital told clients to route away from their execution venues, although the precise timing on that is unknown). When one trading venue experiences technical issues it is difficult to postulate on the possible cause but when multiple venues have similar issues it is reasonable to look for explanations at a systemic level.

The over sized profits of HFT strategies in 2008 brought unwanted publicity and ultimately a wave of new competitors to market. This new wave of HFTs has resulted in ever growing market data volumes, putting greater and greater stress on the various technology applications within the system. HFT trading and order volume is positively correlated with market volatility. As volatility rose sharply on the 6th, so too did HFT message traffic. It would appear this message traffic may have overwhelmed NYSE Arca. When this occurred orders were routed away from Arca to other venues, adding even greater stresses on those systems. This appears to have resulted in systems reaching capacity and slowing down… thus choking on the mass of data.

Market Reaction

When quotes slow down across the board interesting things happen. The HFTs running stat arb strategies that disperse single name volatility across the market have to stop trading because they don't have certainty on the cost of their hedging. While some of our peers have suggested the HFTs stopped trading because they hit their risk limits, we believe (after speaking with some of the larger HFTs) that their systems shut down automatically when they didn't receive order acknowledgements in a timely fashion. A well designed system will have automated kill switches that turn everything off when something doesn't appear right. Slow data and order acknowledgements would trigger such breakers.

As many of the HFT strategies started to shut down single names became more vulnerable to over-sized orders, a good sized sell order on Procter and Gamble was no longer going to interact with a buyer who then offset the risk by selling another consumer goods stock. Likewise, many of the ETF market makers had also shut down their strategies. This would explain why – according to the SECs preliminary findings on May 6th – "trades in the securities issued by ETFs appear to have accounted for nearly 70% of the securities in which trades were broken on May 6".

As this was occurring, the NYSE Liquidity Replenishment Points (LRP) program was kicking in on almost 1,000 issues. As a consequence, when the LRP program kicked in on a name, trading slowed and many Smart Order Routers traded away from the NYSE. This explains why Accenture PLC (ticker ACN on the NYSE) traded at $0.01 from 2:47:54 pm – 2:48:01 pm even though the lowest displayed NYSE bid during that time frame was $38.75. As many have already observed, by taking the NYSE out of their routing tables, dealers were avoiding the one group of participants that were willing and capable of muting the volatility – the Specialist, along with any natural flow residing in the NYSE books. This resulted in an onslaught of market orders being sent by participants, expecting a price close to the displayed NYSE quotes, that received fills at significantly lower levels.

It is interesting to hear a number of voices pin significant blame on retail on-stop orders sent at market. While such orders did occur, we would suggest they were not a key driver of the sell off. The SEC preliminary finding indicated "that **short sells** accounted for 70% of the executions against stub quotes between 2:45 pm and 2:50 pm, and approximately 90% of executions against stub quotes between 2:50 p.m. and 2:55 p.m." Retail clients rarely enter on-stop short sales. The high level of short sell orders executing against stub quotes indicates it was professional traders – not retail investors – trading at the lows.

Marketplace Reform

There are a variety of issues that need to be addressed by the marketplace and regulators, namely:

- Incenting real orders back to the visible book
- Market wide circuit breakers
- After-the-fact cancellations of valid trades
- Message traffic

We are most interested in the potential impact of unchecked message traffic on the market, as we believe it is the least understood factor and the easiest to fix. The marketplace currently offers no incentive for programmers to design their algorithms efficiently. While some firms are able to run complex HFT strategies sending roughly 10 orders for every fill, others running similar strategies are currently sending hundreds, even thousands, of orders per fill. These inefficient strategies hog bandwidth and stress marketplace systems. In Canada, we have been informed by one vendor that message traffic has grown 20 fold over the past 4 years, during which time trading volumes have grown by roughly 25%. We had discussed order-to-fill ratios in a paper released last August. At that time we had included a chart showing the order to trade ratio for each of the visible trading venues on a standard day. The growth in message traffic since then has been stunning.

	10-Aug-09			19-May-10		
Market-place	Orders	Trades	Order/Trade Ratio	Orders	Trades	Order/Trade Ratio
TSX	**27,812,224**	536,386	52	**102,054,551**	1,261,097	81
TSXV	117,013	21,559	5	488,094	34,590	14
Chi-X	**16,013,453**	70,543	**227**	**92,227,433**	345,019	**267**
Pure	1,642,025	6,483	**253**	6,946,805	14,998	**463**
Alpha	1,309,787	77,190	17	**25,305,631**	378,211	67
Omega*	0	0	0	3,049,500	8,489	**359**
Total	**46,894,502**	**712,161**	**66**	**230,072,014**	**2,042,404**	**113**

Source: ITS, *Omega had an outage on Aug 10, 2009

Not surprisingly the Canadian marketplace has seen a notable increase in outages related to data traffic. Just last Friday the TSX had significant slowness in many of its systems that was a direct result of the recent increase in message traffic. Not only are the trading venues themselves having issues, but systems at the dealers, vendors and buy-side institutions are creaking under the sudden stress. If message traffic continues to increase on its current trajectory, it is only a matter of time before we witness our own "flash crash"... delayed quotes causing uncertainty and resulting in trades outside reasonable levels. Such an event would not be good for already fragile investor confidence.

While we have been unable to attain similar data for the U.S. markets, we would be shocked if the message traffic growth wasn't at least of a similar scale.

We discuss a few ways to mitigate some of these issues in the marketplace.

Fair allocation of costs

We have suggested in the past that the street's regulatory bill be split into two portions – human resources and technology. The HR cost, that is the cost of having regulatory staff, should be divided amongst the street based on either volume of shares traded, or number of trades. This reflects the fact that staff time is spent looking at actual trades. The technology portion should then be allocated based on share of message traffic. This reflects the fact that technology costs are driven by message traffic not traded volume. This type of allocation system would result in inefficient strategies having to pay a higher portion of the total bill**. This would be true of any inefficient strategy, whether it be an agency pairs trading algorithm or a passive rebate HFT strategy.** (Currently the total cost is allocated to trading venues based on volume traded market share, which they then charge back to the dealers using the same metric).

Speed Limits

Furthermore, the regulators need to seriously consider setting absolute limits on trading speed. Currently market venues are competing on the ability to handle message traffic at higher rates. Competitive forces dictate that no venue will throttle message rates as this would place them at a competitive disadvantage. We believe that when game theory forces market participants to act in a manner that is not in the best interests of the marketplace this is the time when regulators must place reasonable limits on everyone. To those who paint this argument as the despairing cry of the Luddites, we reply that we are not asking to go back to the days of horse and buggy. We believe that marketplaces are like a highway - there needs to be both lower and upper bands on speed. Much like we do not allow horses or F1 cars on a superhighway we believe that allowing marketplaces to be either too slow or too fast introduces dangers for all other users. Reg NMS has already placed a lower band on exchange speed, now they need to define and set upper bands that don't harm real trading but do prevent the unfettered growth of message traffic and all the systematic issues associated with it.

Should regulators decide to 'throttle' marketplaces they need to ensure such measures control rampant message traffic without inhibiting investors trying to achieve or offload a position. As such, we believe that any throttling should key on traders, or systems, with excessive message to fill ratios. Throttling absolute message rates, without consideration for ratios, may unfairly impede large investors attempting to execute large numbers of trades in a short time span. Such orders typically do not create excess stress on market wide systems.

Trade-Through Protection

Canada is the only developed marketplace that enforces full depth of book trade-through as opposed to top of book for each marketplace venue. This implies that the Smart Order Routers in Canada have to process the entire depth of book in all markets in order to satisfy trade-through obligations. The order changes on the entire depth of book dwarf the order changes on just top of book and thus force the Canadian market participants to be consumers of this glut of data. We feel the regulators need to review the trade-through obligations from a technology lens.

Conclusion

In conclusion, while there are clearly many inter-related factors that came together to cause the flash crash of May 6th, the unchecked growth of message traffic has placed a growing stress on market systems that makes such a crash more likely. The growth of such message traffic in Canada, driven largely by inefficient trading strategies, has caused a dislocation between cost creation and payment. Dealers and institutional buyside clients are footing the lion's share of a bill being driven by trading venues and HFTs. The only way to incent a more responsible message traffic level is to ensure those creating the costs are also absorbing them. We believe that if the current situation is allowed to remain, the Canadian marketplace will have its own adverse event driven by excess message traffic. The events of May 6th and last Friday need to be heeded, and quick action needs to be taken.

As always we look forward to feedback from all of our readers. We are always happy to discuss any views you may have with Canada's existing market structure.

Cheers,

Doug Clark
Rizwan Awan, CFA
Jeremy Dietrich
Andrew Ng
Andrew Karsgaard