

Liquidity Black Holes

My interest was piqued by an article about “Liquidity Black Holes”:¹ *This new trading frontier even has its own signature milestone, something called “a liquidity black hole.” It’s a trading phenomenon in which there’s so much intense selling pressure in big-cap stocks that it sucks all the oxygen out of the market and stocks plunge precipitously – as on August 8 when every single stock in the S&P500 ended the day in the red.*

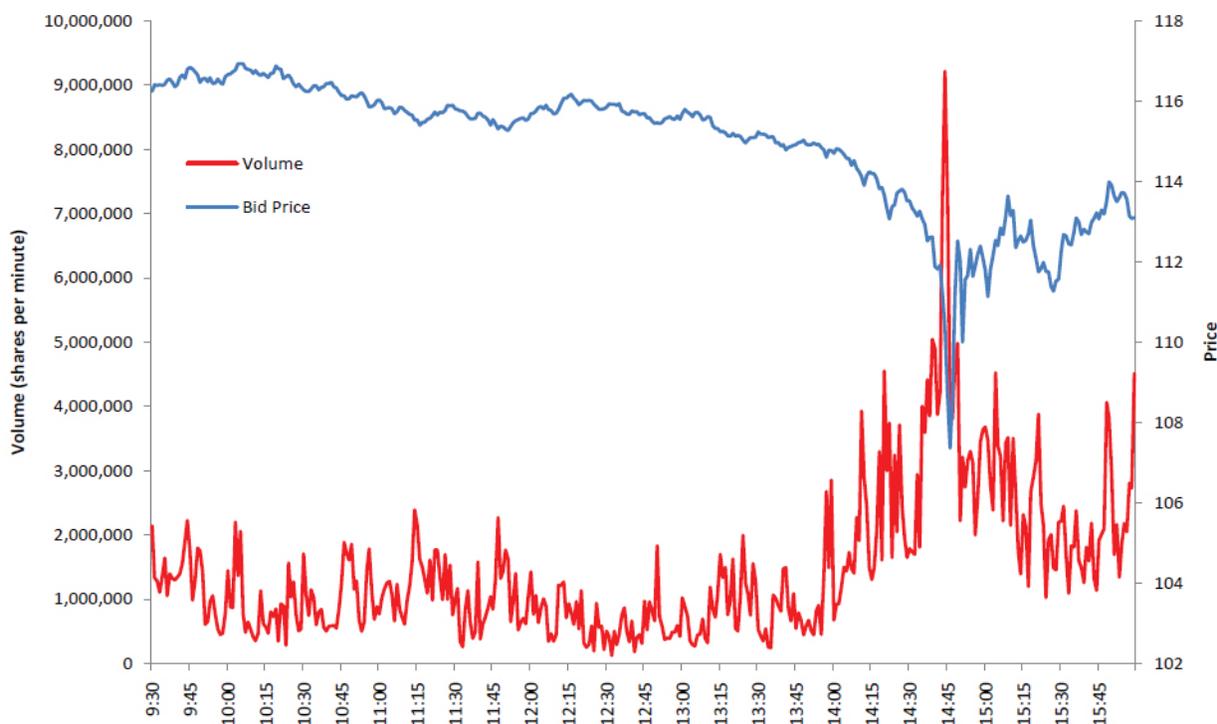
“We have to be aware that we can be hit by one of these liquidity black holes with ever increasing frequency,” says G. Andrew Karolyi, a finance professor at Cornell University Johnson Graduate School of Management. *If you are a long-term buy and hold investor you better be aware of these and not panic when you see it.” ...The trouble for ordinary investors is that there are no good market forecasts for predicting what might spark a liquidity black hole. Fear about the United States and European countries slipping back into recession is a legitimate concern that could have real impact on corporate profits and stocks. But when traders act on those fears at lightning speed it can result in seemingly irrational sell-offs.*

A good theoretical model describing Liquidity Black Holes has been developed by Stephen Morris and Hyun Song Shin:² *Traders with short horizons and privately known loss limits interact in a market for a risky asset. Risk-averse, long horizon traders generate a downward sloping residual demand curve that faces the short-horizon traders. When the price falls close to the loss limits of the short horizon traders, selling of the risky asset by any trader increases the incentives for others to sell. Sales become mutually reinforcing among the short term traders, and payoffs analogous to a bank run are generated. A “liquidity black hole” is the analogue of the run outcome in a bank run model. Short horizon traders sell because others sell. Using global game techniques, we solve for the unique trigger point at which the liquidity black hole comes into existence. Empirical implications include the sharp V-shaped pattern in prices around the time of the liquidity black hole.*

Perhaps the most interesting thing about this paper is its date: November 2003, over six years prior to the Flash Crash of May 6, 2010, which was discussed in the November, 2010 edition of this newsletter. The SEC report on this event³ (which I harshly criticized in that essay) makes no mention of this intellectual basis for the sharp drop and sudden recovery – something that I find terribly suspicious. While I certainly do not expect every regulator and market commentator to be familiar with this material (I certainly wasn’t, at the time I wrote that essay!) it must be emphasized that knowledge does not exist in a vacuum – surely, given all the regulatory staff engaged in the study and all the commentary solicited from so many market participants, somebody would have brought to their attention the similarity between Morris and Shin’s “the sharp V-shaped pattern in prices” and the plot of the SPY ETF on May 6, 2010, shown in Chart A-1.

A-1

SPY Volume and Price



¹ Matthew Goldstein, Lauren Tara LaCapra, Jennifer Ablan and Joseph Giannone, *Insight: The madness of Wall Street*, Reuters, 2011-8-19, available on-line at <http://www.reuters.com/article/2011/08/19/us-markets-volatility-idUSTRE77I2SA20110819> (accessed 2011-12-8)

² Stephen Morris & Hyun Song Shin, *Liquidity Black Holes*, 2003-11-3, available on-line at <http://hyunsongshin.org/www/LBH2.pdf> (accessed 2011-12-8); final version published in *Review of Finance* (2004) 8 (1): 1-18. doi: 10.1023/B:EUIF.0000022155.98681.25, available via <http://rof.oxfordjournals.org/content/8/1/1.full.pdf+html>

³ *Findings Regarding the Market Events of May 6, 2010*, Report of the Staffs of the CFTC and SEC to the Joint Advisory Committee on Emerging Regulatory Issues, available on-line at <http://sec.gov/news/studies/2010/marketevents-report.pdf> (accessed 2011-12-8)

The Morris and Shin model prescribes two types of trader: Type A has a long time horizon and are willing to buy assets if they are sufficiently below their expectation of fair value to make the purchase profitable. Type B has much less capital – they must finance their inventories with Type A market participants. For the rest of this explanation, I will refer to Type A participants as Investors and Type B as Traders.

The necessity for Traders to refinance their inventories regularly imposes a loss limit on their trading, which has an important effect: while both types of participants have the same perception of the ultimate value of the asset being traded and seek to maximize their profits from this knowledge, Traders will be eliminated from the game if at any time the value of their position (whether cash or the market value of the asset held) is less than a certain figure – their loss limit.

On Date 1 there is a shock to the market and Traders are faced with the choice of selling or holding; all of the buying is done by Investors. Thus, given that Traders know the shape of the demand curve (the limit buy orders placed by Investors), but do not know the loss limits of other Traders, the authors derive relationships with the result that: *The trader bails out at a much higher price than his loss limit because he is apprehensive about the effect of other traders bailing out. Just as in the run outcome in a bank run game, the traders in the illiquid market bail out more aggressively when they fear the bailing out of other traders.*

And, when examined on the scale of the market, rather than according to the results of individual traders: *Another implication of our model is that the trading volume at the time of the liquidity black hole and its aftermath will be considerable. When the market strikes the liquidity black hole, the whole of the asset holding in the risky asset changes hands from the risk-neutral short horizon traders to the risk-averse market making sector. Although we have not modelled the dynamics, we could envisage that immediately afterwards, once the loss limits have been adjusted down given the new price, there will be an immediate reversal of the trades in which the risky asset ends up back in the hands of the risk neutral traders once more. The large trading volume that is generated by these reversals will be associated with the sharp V-shaped price dynamics already noted. The association between the V-shaped pattern in prices and the large trading volume is consistent with the evidence found in Campbell, Grossman and Wang (1993)⁴ and Pastor and Stambaugh (2002).⁵*

Herd behaviour?

These results are interesting, because they provide an explanation for aberrant stock market behaviour that does not rely on sneering at traders and their computers, as G. Andrew Karolyi, a finance professor at Cornell University, did in the Reuters article that prompted this literature review: *Karolyi says the waves of wholesale selling driven by liquidity black holes are not just the byproduct of the over-computerization of trading, it's the end result of too much "group think" by institutional traders.*

He says Wall Street first saw this in August 2007, when dozens of quant hedge funds suffered big losses at the start of the financial crisis because the algos they employed were all buying and selling the same securities. This flawed thinking by some of Wall Street's brightest math geeks was an early warning sign of even worse group think to come with regards to the value of securities backed by subprime mortgages.

Despite my suspicion of explanations of behaviour that rely on the assumption of stupidity, Dr. Karolyi's opinions cannot be ignored. In the recent paper⁶ referenced by the Reuters article he notes *Commonality in liquidity in a country tends to be greater when the equity market of that country experiences larger foreign capital inflows. As capital flows are mainly driven by institutional investors, this finding is in line with the arguments of Kamara, Lou, and Sadka (2008)⁷ and Koch, Ruenzi, and Starks (2009)⁸ that the correlated trading behavior of institutional investors increases commonality.*

The Kamara paper notes that *The diversification benefits of small-stock portfolios have increased over time, whereas, the diversification benefits of large-stock portfolios have declined over time*, with the transmission mechanism of large-stock commonality being basket trading and the rise of ETFs by institutional traders, while the Koch paper focuses on mutual fund ownership as the driving factor. These conclusions are further supported by a February 2000 working paper by Dennis and Strickland.⁹

Dr. Karolyi's paper concludes that *Although funding liquidity may be a key driver of commonality in liquidity in U.S. equity markets, our evidence indicates that institutional and foreign investor involvement, information acquisition incentives, investor sentiment, and correlated trading activity, in general, contribute more to explaining the level and dynamics of commonality in liquidity in a large number of other countries.*

In and of itself, this is an unsatisfactory explanation for the prevalence of "liquidity black holes", although it does help to explain how liquidity shocks are transmitted through the marketplace. While "groupthink" might explain how individual events become systemic, it does not explain what might be called 'flash crash behaviour', which I will define here as the brief and steep V-shaped trading pattern, accompanied by heavy volume, noted by Morris and Shin.

⁴ John Y. Campbell, Sanford J. Grossman and Jiang Wang, *Trading Volume and Serial Correlation in Stock Returns*, The Quarterly Journal of Economics, November 1993, available on-line at <http://web.mit.edu/wangj/www/pap/CampbellGrossmanWang93.pdf> (accessed 2011-12-9)

⁵ Lubos Pastor and Robert F. Stambaugh, *Liquidity Risk and Expected Stock Returns*, 2002-7-11, available on-line at <http://faculty.chicagobooth.edu/lubos.pastor/research/liquidity.pdf> (accessed 2011-12-9)

⁶ George Andrew Karolyi, Kuan-Hui Lee and Mathijs A. Van Dijk, *Understanding Commonality in Liquidity Around the World*, 2011-7-16, Journal of Financial Economics (forthcoming), available on-line at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1014063 (accessed 2011-12-9)

⁷ Avraham Kamara, Xiaoxia Lou and Ronnie Sadka, *The Divergence of Liquidity Commonality in the Cross-Section of Stocks*, 2007-7-15, Journal of Financial Economics 2008, available on-line at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=943040 (accessed 2011-12-9)

⁸ Andy Koch, Stefan Ruenzi, and Laura Starks, *Commonality in Liquidity: A Demand-Side Explanation*, September 2010, available on-line at <https://webspaces.utexas.edu/awk227/www/KRS2010.pdf> (accessed 2011-12-10)

⁹ Patrick J. Dennis and Deon Strickland, *Who Blinks in Volatile Markets, Individuals or Institutions?*, Dice Center Working Paper No. 2000-7, available on-line at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=227715 (accessed 2011-12-9)

Additionally, the relatively brief duration of such crashes – a day or two at most, and only half an hour or so in the case of the May 6, 2010, Flash Crash – is not a realistic time-frame for the formation of a consensus amongst group-thinkers: thus, if group-think is a contributor to the prevalence of flash crash behaviour, it must be manifested as the result of a commonality of short-term response to pre-defined conditions.

Correlation or Causation?

Dr. Karolyi put particular emphasis on the performance of hedge funds in August 2007, which is of interest because those events have been previously discussed in this newsletter,¹⁰ with emphasis on a paper¹¹ by Khandani and Lo that concluded: *During the week of August 6, 2007, a number of high-profile and highly successful quantitative long/short equity hedge funds experienced unprecedented losses. Based on empirical results from TASS hedge-fund data as well as the simulated performance of a specific long/short equity strategy, we hypothesize that the losses were initiated by the rapid unwinding of one or more sizable quantitative equity market-neutral portfolios. Given the speed and price impact with which this occurred, it was likely the result of a sudden liquidation by a multi-strategy fund or proprietary-trading desk, possibly due to margin calls or a risk reduction. These initial losses then put pressure on a broader set of long/short and long-only equity portfolios, causing further losses on August 9th by triggering stop-loss and de-leveraging policies.*

Khandani and Lo draw particular attention to increased leverage, taken on to maintain profitability in the face of increasing market efficiency, as a probably contributory factor in the speed and severity of the losses experienced by the hedge funds during the week, which ties in beautifully with the risk aversion highlighted by Morris and Shin: all else being equal, a highly leveraged fund will be more risk averse (in terms of loss limits) than a less leveraged one, simply because it is more susceptible to margin calls and subsequent forced-liquidation.

Reuters quoted one of the co-authors: *“The market we are operating in is markedly different from five years ago,” says Andrew Lo, a professor of finance at the MIT Sloan School of Management, who frequently writes on hedge fund trading strategies and markets. “We are seeing extraordinary emotional reactions from central banks, politicians, regulators and investors. That kind of reaction is not conducive for building long-term wealth. We have an environment that is highly unstable.”* On the surface, it would appear that Dr. Lo is as worried about attempts to fix the problem as he is by the problem itself – or it could be that I am simply projecting my own fears onto his statement!

The question of correlated losses due to similar strategies makes one wonder precisely what Dr. Karolyi means when he uses the word groupthink. In my mind, ‘groupthink’ suggests causation: I swallow any doubts I might have and agree with Bob’s plan, because Bob’s a pretty smart guy and agreeing with him entails less work and less career risk than disagreeing with him anyway. But if, after the strategy meeting, both Bob and I put coats on because it’s minus 20 outside, then our actions, while correlated, do not exemplify ‘groupthink’: they are merely identical, rational responses to common conditions. Correlation does not imply causation! For example, Boysen et al. find¹² that hedge fund returns exhibit clustering of their worst decile of monthly returns, but find more evidence to support the idea that this is due to a common reaction to exogenous shocks than to actual contagion. The fact that the clustering of returns occurs across styles is an argument against the ‘groupthink’ hypothesis.

Profiting from a Flash Crash

In the model of Morris and Shin is embodied the assumption that *it is common knowledge that the liquidation value of the asset is normal with mean v and variance σ^2 . There are two groups of traders in the market, and the realization of v at date 1 is common knowledge among all of them.* Thus, when a liquidity shock is experienced on date 1, all traders know perfectly well that the prices are unconscionably low – but they also know that there is no lower bound on the price at the end of date 1, at which point the Traders will be bankrupted if they exceed their loss limit. Investors, who are assumed to have a bottomless supply of cash, are compensated for their willingness to buy the risk asset in accordance with their demand curve with excess returns based on the decline of price from its equilibrium level to its shocked level.

However, a bottomless supply of Investor cash and a previously input sequence of limit buy orders entered in precise accordance with the demand curve are rather extreme assumptions to make. As stated by Bernardo and Welch:¹³ *It is not easy to get rich in crash situations. It is costly to create buffer stock or stand-by liquidity and the uncertainty in execution makes exploiting the bottom difficult. A large arbitrageur might have to lurk for years with ample financial slack to profit from the rare crash. [Footnote] Thus, the market-making sector may be smaller than often assumed. In sum, we believe liquidity runs and crashes to be sufficiently rare phenomena that moderating market forces may not be sufficiently profitable to take effect instantly.*

The footnote in the above is interesting, referencing a 1988 paper by Greenwald and Stein¹⁴ that makes the point: *Maintaining a significantly large amount of capital on hand on a daily basis is an expensive proposition; moreover it would be unnecessary 99 percent of the time.* They go on to suggest, rather quaintly in light of our experience of the past few years, that insurance companies could provide such contingent capital – in exchange for regular premia, the policy could specify that, for instance, on a downward move exceeding some limit, accompanied by excess volume, the insurer would purchase a large fraction of the market-makers’ inventory at cost. We have learned in the past few years that in the event of steep market declines, insurance companies are more likely to require contingent capital than to provide it!

¹⁰ December, 2009

¹¹ Amir E. Khandani and Andrew W. Lo, *What Happened To The Quants in August 2007?*, available on-line at <http://web.mit.edu/alo/www/Papers/august07.pdf> (accessed 2011-12-10)

¹² Nicole M. Boysen, Christof W. Stahel, and René M. Stulz, *Why do hedge funds’ worst returns cluster? Common liquidity shocks vs. contagion*, 2008-11-10, available on-line at http://www.primia.org/Chapter_Pages/Data/Files/2814_3227__Hedge_fund_clustering_Nov_10_final_presentation.pdf (accessed 2011-12-10) and <http://www.banque-france.fr/fr/publications/revues/seminaires-et-colloques/telechar/Hedge-fund-contagion-and-liquidity-Stulz.pdf> (accessed 2011-12-10)

¹³ Antonio E. Bernardo and Ivo Welch, *Liquidity and Financial Market Runs*, Yale ICF Working Paper No. 02-11; AFA 2003 Washington, DC Meetings, available on-line at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=307719 (accessed 2011-12-10)

¹⁴ Bruce Greenwald and Jeremy Stein, *The Task Force Report: The Reasoning Behind the Recommendations*, Journal of Economic Perspectives, Summer 1988, available on-line at <http://www.economics.harvard.edu/faculty/stein/files/JEP-1988.pdf> (accessed 2011-12-9)

As an aside, another observation by Greenwald and Stein is noteworthy for having been invalidated by technology: *Of course, by submitting a “limit” order (i.e. an order to buy only at prices below a certain limit) an investor can protect himself from buying at an unexpectedly high price, or selling at an unexpectedly low one. However, limit orders do not represent an especially attractive alternative under the conditions of October 19th and 20th [1987]. An investor’s threshold price should depend on his most current information, which includes the current market price. Under very volatile conditions, this can mean resubmitting limit orders on an almost continuous basis, which would have been extremely difficult to accomplish. Well, not any more!*

However, the withdrawal of liquidity by opportunistic investors in times of stress is well known:¹⁵ *As Tuesday’s results clearly indicate, limit order traders respond to extreme volatility by providing fewer shares and by placing those shares at less aggressive prices. An interesting puzzle, however, is that this predicted behavior happened on Tuesday after the extreme market movement, rather than on Monday. These results suggest that adverse selection costs are extremely high after a day of extreme market movements or potentially after a market closure.*

Fear of adverse selection is certainly a major problem, one that is not addressed in the Morris and Shin model which, it is worth re-emphasizing, assumes that *it is common knowledge that the liquidation value of the asset is normal with mean v and variance σ^2* . It is all very well to construct theories regarding the profitability of entering orders during a Flash Crash in the comfort of one’s study, but it is another thing to put capital on the line on the spur of the moment ... what if the mean v and the variance σ^2 have changed due to news in the course of the day and everybody knows it except you?

The SEC Flash Crash report however, considers liquidity withdrawal to be new and startling information: *Another key lesson from May 6 is that many market participants employ their own versions of a trading pause – either generally or in particular products – based on different combinations of market signals. Any practitioner could have told them that well in advance and, in fact, the problem of market-maker withdrawal from volatile markets was highlighted in the investigation of the 1987 market crash.*¹⁶ However, as I discussed in the November, 2010, edition of this newsletter, I do not believe that the SEC Flash Crash report displayed much rigour or intellectual honesty – the document has all the earmarks of a pre-judged indictment, written to justify a heavy-handed regulatory response to market changes.

A Possible New Order Type?

As discussed above, a key factor in the occurrence of Flash Crashes is the cascading effect of sell orders from participants who reach their loss limits (the “stop-loss” order, so beloved by retail, is merely a formalization of this tendency) combined with the withdrawal of liquidity by market participants who fear that there has been a paradigm shift in their prior assessments of fair value.

Additionally, the existence of buy orders in accordance with the demand curve (based on the evaluation of the fair value v and its variance σ^2) is by no means assured – there is little reason for Investors to input these orders in advance, given that there is a processing cost associated with this activity and, possibly, a loss of information that these Investors would rather keep private.

To this is added a shortage of capital, since many natural providers of contingent capital, such as the insurance companies suggested by Greenwald and Stein, are themselves adversely affected by a sharp decline in market prices and will be unwilling to provide the funding for a short-term speculative venture.

Finally, the increasing correlation of marketable securities means that once a flash crash has gained momentum it becomes very broad, so that it is less likely that an investor will be able to sell an unaffected security in sufficient size to retard the decline of an affected security with a purchase – in fact, while this mechanism may well be effective in relatively mild cases, it serves as a contagion mechanism when the pressure is more severe.

The obvious answer to these problems is to pay somebody – not an insurance company, or other institution with ‘wrong way risk’ – to put up the contingent capital – the question is how to design such a mechanism?

One solution is to encourage Irrevocable Limit Orders (ILOs), which I envisage as much like regular limit orders, but with the additional features:

- They must be input prior to the opening of the market
- They cannot be cancelled. They will either be filled during the course of the day, or expire after the close of the trading session.
- They are allowed only at certain offsets to the previous closing price of the security – ILO Buys, for instance, could be allowable at prices of 5%, 6%, 7%, etc., below the previous close
- Critically, investors entering these orders will get paid for them: trades executed on an exchange will be subjected to an additional charge (say, \$0.001 per share), this money pooled and paid to ILO order enterers in accordance with a scheme of relative value, regardless of whether or not these orders were executed.

After all, exchanges are currently competing for liquidity by paying rebates to the passive side of trades;¹⁷ why not extend this concept to limit orders with specified attributes which do not, in fact, get executed?

I will not go so far as to say I advocate adoption of this plan – it is a very complex area and there are many potential pitfalls. For instance, say an investor has an ILO-Buy outstanding at \$50.00 and the security price declines to \$50.50. Since he may not cancel the order, he may be tempted to sell short at \$50.50, which would actually net him a profit if the decline continued and his ILO-Buy was executed. The net effect of this investor’s trading strategy might be to exacerbate flash crashes, rather than mitigate them; on the other hand, the riskiness of shorting the stock might make the strategy unprofitable – in which case the investor has, in fact, contributed capital to mitigate the gross effects of a flash crash.

¹⁵ Michael A. Goldstein and Kenneth A. Kavajecz, *Liquidity Provision During Circuit Breakers and Extreme Market Movements*, AFA 2001 New Orleans; Rodney L. White Ctr for Financial Research Working Paper No. 01-00, available on-line at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=208292 (accessed 2011-12-9)

¹⁶ *Report of the Presidential Task Force on Market Mechanisms*, aka “The Brady Report” available on-line at <http://www.archive.org/details/reportofpresiden01unit> (accessed 2011-12-10)

¹⁷ See the September, 2010, and November, 2009, editions of this newsletter

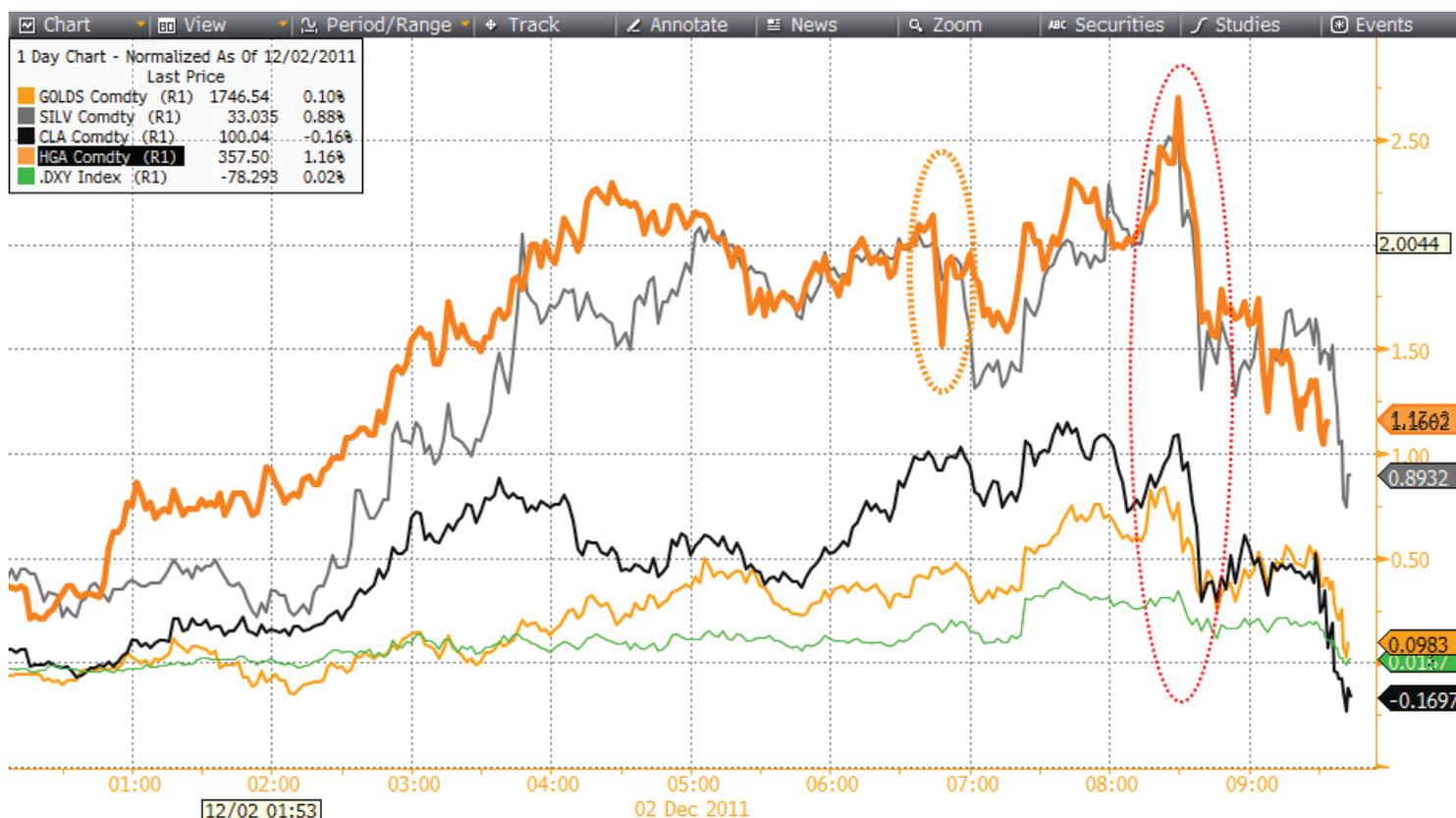
Additionally, it will not escape notice that an ILO-Buy is precisely equivalent to selling a put (albeit well out of the money and with same-day expiry). Care should be taken to establish that there are no arbitrage strategies that serve merely to change the focus and transmission mechanism of a flash crash.

In favour of the plan, I can only say that I have much more faith in a system that rewards work done (in this case, the provision of liquidity) with actual cash than I do in systems that seek to accomplish these goals with a thicket of regulations.

Frequency of Flash Crashes

The well known blog Zero Hedge¹⁸ makes something of a fetish of reporting flash crashes; most recently flagging copper at the London Metals Exchange:¹⁹ in Chart A-2, “The orange oval shows the flash crash event and then shortly afterwards the red oval shows the market’s reaction to the NFP print.”

A-2



Well, that looks like pretty sorry excuse for Flash Crash to me, but we will all have our own definitions! They do have better recent examples.²⁰

At any rate, I believe that Flash Crashes will always be with us, simply due to human nature. The explanatory mechanism of Morris and Shin is compelling, but there are others, often self-imposed: Stop-Loss orders, for instance, are merely a formalization of the “get out before you’re wiped out” mentality forced on leveraged traders with loss limits and, in the fixed income market, there are many investors and advisors who are so terrified by the prospect of holding a defaulting bond that they will sell at the first whiff of trouble – usually taking a newly downgraded instrument well below what might be considered fair value. This also applies to insurance companies, which might be constrained by regulation to dispose of downgraded bonds at less than fair prices²¹ – and, in fact, to anybody who takes market action contrary to a sober assessment of fair value, whether due to externally imposed constraints or voluntarily.

¹⁸ <http://www.zerohedge.com>

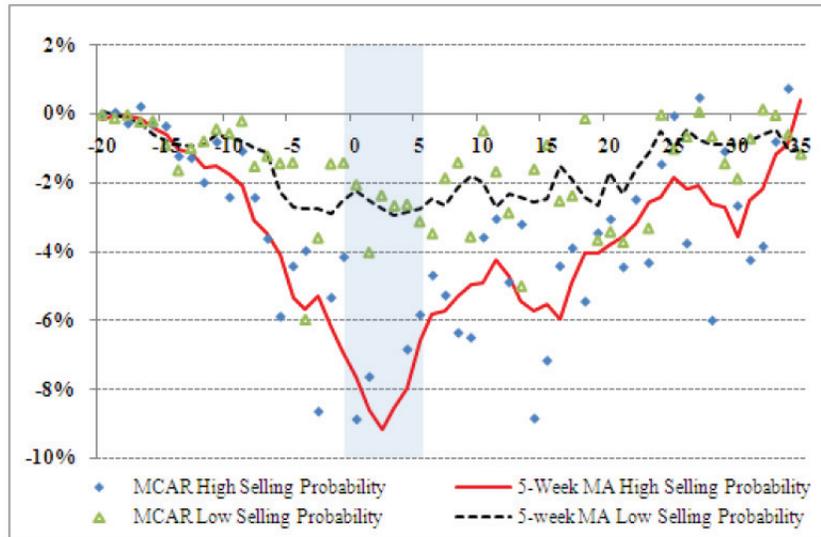
¹⁹ Zero Hedge, *Did LME 'Flash Crash'? Forewarn NFP Debacle*, 2011-12-2, available on-line at <http://www.zerohedge.com/news/did-lme-flash-crash-forewarn-nfp-debacle> (accessed 2011-12-10)

²⁰ e.g., Zero Hedge, *Mini Flash Crash? ES Plunges By 2 Standard Deviations In 5 Minutes*, 2011-11-23, available on-line at <http://www.zerohedge.com/news/mini-flash-crash-es-plunges-2-standard-deviations-5-minutes> (accessed 2011-12-10) and *Today's Flash Crash: 75% Loss On A \$10 Billion Market Cap Company In One Second*, 2011-7-12, available on-line at <http://www.zerohedge.com/article/todays-flash-crash-75-loss-10-billion-market-cap-company-one-second> (accessed 2011-12-10). I wouldn't count the second one as an actual “Flash Crash” since the volume was very low.

²¹ Andrew Ellul, Pab Jotikasthira and Christian T. Lundblad, *Regulatory Pressure and Fire Sales in the Corporate Bond Market*, AFA 2011 Denver Meetings Paper, 2010-10-4, available on-line at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1362182 (accessed 2011-12-10)

Chart A-3, taken from the paper by Ellul et al. referenced above, shows their results for Median Cumulative Abnormal Returns by Average Selling Probability, with two groups of downgraded bonds defined by their measure of selling pressure based on insurance company data. This figure plots the median cumulative abnormal returns (MCARs) for downgraded bonds grouped by bond-level average selling probability. Event week is in the X-axis and week 0 is the downgrade announcement week.

A-3



Investment Conclusions

As weary readers will have worked out for themselves by now, this essay does not present any magic formulae that guarantee instant success in the Canadian preferred share market – I simply felt that the concept of “Liquidity Black Holes” was interesting enough that I should pass on the information to assist readers to understand the market, and some of the academic research surrounding the market, a little better.

However, there is one salient investment truism that should be remembered: the price of investment instruments can vary, sometimes very sharply, for reasons that have absolutely nothing to do with the fundamental value of that investment – even when both buyers and sellers have identical views on how that fundamental value can be estimated.