TRANSACTION**ANALYSIS**

Market Structure Research
May 2011

Flash Crash Retrospective: Limit Up-Limit Down is the Best Response

Key Takeaways

- On May 6, 2010, while equities endured an historic crash, the CME's Stop Logic functionality curbed the downward movement of futures prices.
- In response, the SEC implemented the Single Stock Circuit Breaker pilot program to curb stock market volatility and has recently proposed a Limit Up-Limit Down mechanism to replace it.
- After examining the market's performance on March 31, 2011, when 10 ETFs experienced a mini flash crash, Instinet believes the Limit Up-Limit Down mechanism is the best regulatory framework, as it maximizes clarity while minimizing operationally cumbersome issues related to the cancellation of trades.

On May 6, 2010, an order to sell 75,000 CME E-mini futures contracts contributed to an already jumpy market and triggered the CME's stop logic functionality, leading to a five second pause in trading. In equity markets, however, no such market-wide mechanisms existed and as liquidity dried up, many stocks traded at prices close to zero. The NYSE's Liquidity Replenishment Points (LRPs) kicked in, but due to the fragmented nature of US market structure, other venues did not follow suit and experienced unreasonable price moves. While the markets largely recovered within minutes, many of the trades were subsequently cancelled (see our October 2010 piece, **Flash Crash: A Smoking Gun?**, for more information).

In response to the unprecedented volatility, the SEC subsequently:

- clarified the definition of "clearly erroneous trades";
- banned "naked" sponsored access, effective July 14, 2011;
- implemented a Single Stock Circuit Breaker pilot program, which will soon be revised to a Limit Up-Limit Down system.

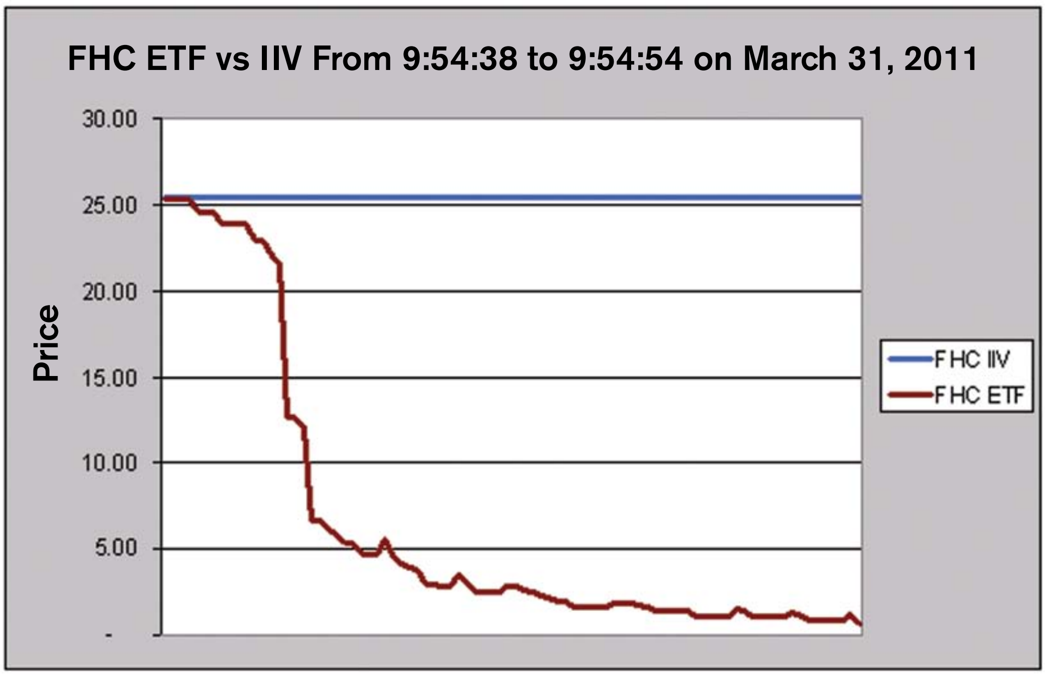
The Single Stock Circuit Breaker (SSCB) pilot program was implemented in June 2010 for stocks in the S&P 500 Index, the Russell 1000 Index and certain actively traded Exchange Traded Funds (ETFs). On March 31, 2011, 10 of the 15 Focus Morningstar ETFs (which are not part of the pilot program) experienced a mini flash crash that we examine here to compare and contrast the various current and proposed price protection mechanisms.

March 31, 2011

15 Focus Morningstar ETFs were issued on March 30, 2011. The following day, the products experienced significant volatility triggering the Clearly Erroneous rules. The event happened at the same time in 10 of the Focus ETFs. Here is what happened in the case of Focus Morningstar Heath Care Index ETF (ticker FHC):

On March 31, FHC opened at $25.32 on NYSE at 9:54:38 am. Trades continued at consecutively lower prices, trading a total of 14,000 shares below $22.89 and hitting a low of 60 cents by 9:54:54. Trades occurred primarily on NYSE Arca and NASDAQ, but there were also executions on BATS and EDGX. Since issuance, FHC's volume has averaged only about 3,000 shares a day, except for March 31, when 29,800 shares were traded (not including cancelled trades).

Clearly some market participant made an error in sending so many marketable orders in a name that had no trading history. The ETF tracks the Morningstar Heath Care Index, which does not have an associated futures contract. Order book data indicates that there is one market maker who keeps the spread tight around its intrinsic value and little to no other trading interest in the name. Note also that the largest health care stocks in the US showed no abnormal activity while FHC was experiencing this mini flash crash. The chart below shows the Intraday Indicative Value of the Morningstar Health Care Index versus the price of FHC during the crash.



Actual Scenario: Clearly Erroneous Trades

All trades below $22.89 were cancelled under the Clearly Erroneous rules. The rules state that for non-SSCB stocks (the Focus ETFs are not on the list of actively traded ETFs covered under the pilot program), in events impacting 5-20 stocks, trades more than 10% away from the reference price will be broken. Using the opening price of $25.32 as the reference price, any trades under $22.79 would be broken, which is exactly what happened as the tape jumped from $22.89 to $22.08 and all trades less than $22.89 were cancelled.

This solution is not ideal. Trades occurred and were cancelled. This makes risk management difficult for those traders who executed trades that were to be cancelled. Transparent guidelines certainly improve the situation but this solution is operationally cumbersome, time consuming and exposes traders to risk. In particular, erroneous trades can result in unauthorized short positions and/or short positions in hard to borrow names.

Hypothetical Scenario: NYSE Volatility Trading Pause

As an ETF that trades on NYSE Arca, FHC is not eligible for the Volatility Trading Pause.

Hypothetical Scenario: Single Stock Circuit Breakers

If the Focus ETFs were included in the pilot program, the stock would have been paused market-wide for five minutes once the first trade printed below $22.79, since $22.79 is more than 10% away from the circuit breaker trigger price, which in this case is the opening price.

SSCBs would have addressed the vast majority of the issues. Only a 100 share fill at $22.08 would have stood, and it would later have been cancelled under the Clearly Erroneous rules.

Hypothetical Scenario: Limit Up-Limit Down

Under Limit Up-Limit Down (LULD), the opening price would have been the reference price since the offending trades took place within seconds of the first trade of the day. Thus no trades would have been permitted at less than $22.79.

This is the ideal scenario, as no trades under $22.89 would have occurred. As LULD has been proposed (details are still pending), the protection is so robust in concept that market participants could conceivably contemplate relying solely on it to prevent illegitimate fills, which begs the question of responsibility. Does this matter? It most definitely does. If participants rely solely on LULD there will, by definition, be more volatility as LULD bands are hit more often. Firms must continue to take ownership of their own risk management as the LULD bands are still large and losses could ensue. Best execution, however nebulous, would most certainly not be satisfied by relying on LULD bands alone.

Conclusion

If adopted, LULD will have to be implemented by the market centers according to the details stipulated by the SEC. It is possible that the regulators will mandate the continuation of pausing mechanisms in addition to LULD. When LULD is submitted for comment, the details of exactly what it will require from the exchanges and how its implementation will interact with existing price protection mechanisms will become clear; we believe this will likely lead to changes in the structure of both NYSE's Volatility Trading Pause and NASDAQ's Volatility Trading Guard.

SSCBs and LULD are not band-aid measures. These mechanisms allow markets to trade and evolve without the interference of regulatory intervention while at the same time adding safeguards for situations of extreme volatility. Most of the mini flash crashes we've seen would have been prevented if the stocks involved were covered under the SSCB program and soon LULD, which will apply to all NMS stocks.

Appendix:

Market-Wide Price Protection Mechanisms

Market-Wide Circuit Breakers Based on DJIA

	Before 2:00 pm	2:00 - 2:30 pm	After 2:30 pm
10% Decline in DJIA	1 hour halt	30 minute halt	no action
	Before 1:00 pm	**1:00 - 2:00 pm**	**After 2:00 pm**
20% Decline in DJIA	2 hour halt	1 hour halt	market closes for the day
30% Decline in DJIA	market closes for the day	market closes for the day	market closes for the day

Single Stock Circuit Breaker Pilot Program

- Running since June 16th, 2010 and set to expire on August 11th, 2011.
- Covers stocks in the S&P 500 Index, the Russell 1000 Index and a list of heavily traded ETFs.
- Effective from 9:45 am - 3:35 pm ET.
- If a stock moves 10% over a five minute period, the stock and its options are paused market-wide for five minutes. After five minutes, the pause may be extended if significant imbalances remain.

Short Sale Circuit Breakers

- Effective February 28, 2011.
- Covers all NMS Securities.
- If a stock falls more than 10% on a given day, short selling will only be allowed above the National Best Bid that day. Arbitrage and riskless principal transactions are exempted but there is no exemption for market making.

Limit Up-Limit Down Proposal

- Proposed on April 5, 2011 as a one-year pilot program replacing the SSCB program, and will soon be opened up for comment.
- Covers all NMS Securities.
- Prevents trades outside a price band. Stocks in the SSCB program would be subject to a 5% price band, while all other stocks would be subject to a 10% price band. The reference price would be the mean price over the preceding five minutes. Stocks below $1 would be banded at the lesser of either $0.15 or 75%. In the first 15 and last 25 minutes of trading the bands would be doubled. If the band led to no trading and no National Best Quote resting on the Limit Band Price within 15 seconds, there would be a five minute trading pause. At the open, the opening price is

the reference price unless the mean of trades after the open is more than 1% away from the open.

- LULD does not reject orders but readjusts the price on trades to the bands.
- LULD prevents erroneous trades as no trades can occur outside the ban. It also limits the amount of time stocks are paused as a pause only occurs if there is a 15 second break in trading.

Clearly Erroneous Trading Rules

- FINRA's application to amend the Clearly Erroneous trading rules was approved by the SEC on September 10, 2010.
- For stocks less than $25, trades are broken if they are 10% away from the circuit breaker trigger price. For stocks between $25 and $50, trades will be broken if they are 5% away from the circuit breaker trigger price. For stocks greater than $50, trades will be broken if they are 3% away from the circuit breaker trigger price. For non-SSCB stocks, if an event impacts 5-20 stocks, trades more than 10% away from the last price will be broken. For an event impacting more than 20 stocks, trades more than 30% away from the last price will be broken.

Venue-Specific Mechanisms

CME Mechanisms

- Trade cancellations and price adjustments outside non-reviewable range.
- Price banding rejects orders outside Clearly Erroneous bands. Price bands are recalculated every time the price changes.
- Daily price limits are prices between which futures cannot trade on a given day. For equity index futures, the daily price limits are coordinated with the market-wide circuit breakers.
- Stop Logic triggers when a series of stop orders will result in trades that are outside of the non-reviewable range from the start of the series. The contract is placed in a state where orders can be entered but trades will not occur.
- "Protection Points" are points at which limit prices will be added to market and stop orders.
- For example, as of April 20, 2011, the following applies to an E-mini S&P 500 contract:

Non reviewable Range	600
Price Band	1200
Protection Points	300
Stop Logic	600
Daily Price Limit (vs previous close)	130 (10% limit down)

NYSE Volatility Trading Pause (VTP)

- Implemented June 7th, 2010, and pilot has been extended past original expiry of December 10, 2010.
- Phased-in implementation, with Russell 1000 and S&P 500 stocks currently included. The next phase will include all NYSE stocks. Note that ETFs are listed on NYSE Arca, which will rely solely on LULD, meaning there is no VTP in ETFs.
- Effective from 9:45 am - 3:35 pm ET.
- If a stock moves 10% in a rolling five minute window, a five minute pause occurs. Imbalance information is broadcast every 15 seconds until reopening. Also, if LULD limit state exists for more than 15 seconds, the VTP will be activated.

NYSE Liquidity Replenishment Points (LRPs)

- If a large price movement (average of 3-5%) occurs over a 10 second time period, LRPs place the market in slow mode", which allows only manual execution. For example, for a $20 stock with an average daily volume of more than 4,000,000 shares, the LRP is 40 cents away form the current price. LRPs are transmitted electronically via FIX.
- Covers all NYSE-listed stocks.
- Volatility trading pause overrides LRPs.

NASDAQ Volatility Trading Guard

- Pilot program will launch on July 15, 2011. Details subject to change after LULD mechanism is specified in detail.
- Only NASDAQ-100 Index securities – not ETFs – will be included.
- Effective from 9:45 am - 3:35 pm ET.
- If a stock moves more than the below threshold over a 30 second period, trading is halted for 1 minute with no extension period. During the pause orders are accepted and the order imbalance indicator is disseminated every five seconds. Options are not halted.
- Stock Price

<$1.75	15%
<$25	10%
<$50	5%
>$50	3%

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