

What Tools Do Vendors Provide to Control the Risks of High Speed Trading?

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For the past several years, various regulatory agencies and industry groups have focused attention on pre and post trade risk controls¹ for high frequency trading, particularly, for firms that access the markets directly. Trading firms that access the markets directly do not use their broker-dealer/futures commission merchant's (FCM) trading system. Rather, they send orders directly to the exchange matching engine via their own proprietary trading platform or via a vendor-provided trading platform the broker-dealer/FCM approves. Such arrangements are referred to as sponsored access in the equities and options markets and as direct market access in futures markets. Trading firms that access markets directly may have pre trade risk controls on their trading platform and/or may rely on pre trade risk controls at the trading venue level.

Broadly speaking, regulatory and industry attention on high frequency trading has produced recommendations and best practices related to how pre and post trade risk controls at one or more levels of the trade life cycle – from trade execution to trade settlement - may be improved. Staff from the Federal Reserve Bank of Chicago's Financial Markets Group used these recommendations as a baseline to elicit information on the controls that are currently in place at each level of the trade life cycle to manage the risks of high speed trading. We define high speed trading as high frequency, automated, and algorithmic trading, since firms engaging in these styles of trading can potentially send thousands of orders to a trading venue within a second(s). It is also important to note that it is difficult to quantify the precise number of orders that would designate a firm as being engaged in high speed trading. As an obvious example, an algorithmic trader could execute 100 trades over the course of a day, which would not be considered high speed trading.

Over thirty interviews were conducted with primarily U.S. domiciled technology vendors, proprietary trading firms, broker dealers and futures commission merchants, exchanges, and clearing houses. Non-U.S. entities interviewed include one exchange, one clearing house and one U.S. branch of a foreign broker-dealer. This article summarizes what was learned from vendors that offer one or more of the following services to high speed trading firms: trading platforms, risk management platforms, data, and co-location/proximity hosting. Conversations focused on product offerings, risk controls, and other issues of interest or concern to these vendors. Future articles will summarize how proprietary trading firms, broker dealers and futures commission merchants, exchanges, and clearing houses control the risks of high speed trading.

Trading Platform Providers

Trading firms that access the markets directly execute trades using trading platforms that are either built in-house, purchased from a vendor, or both. Well designed trading platforms include pre-trade risk checks that if enabled may do one or more of the following: alert a firm when a trade(s) is approaching a pre-set limit, stop trades entirely once a limit is breached, or require traders to take opposite positions when a limit is hit. A host of industry and regulatory reports recommend that trading firms that access the markets directly establish and enforce various pre-trade risk checks such as order size, intraday position, credit and other limits that are appropriate based on a firm's capital, experience, and risk tolerance.²

All the vendors interviewed provide functionality for clearing members³ to establish pre-trade risk limits for their non-clearing customers, since they assume financial responsibility for the trades of each firm they clear. Some vendors also provide functionality for non-clearing members to set limits below those established by the clearing member. However, one vendor reported that some clearing firms have relinquished the administration of pre-trade risk controls to their non-clearing customers in the race to get

more business.⁴ Surrendering such control could expose the clearing firm to potential losses if a trading firm that accesses the markets directly does not set any or establishes inadequate limits. Nevertheless, another vendor believed some kind of pre-trade limits, like price and orders size controls, are always in place.

Various regulatory and industry reports also recommend that trading platforms include a “kill button” that can be used in exigent circumstances to stop all trading activity. Each of the vendors interviewed includes a kill button on their trading platform; however, the way in which they function varies by vendor. Some kill buttons only delete the bids, others only delete the offers, some delete all existing open orders, and others liquidate open positions.⁵ In addition each of the trading platform providers’ kill buttons cancels all GTD orders by default, but some vendors provide the capability to cancel GTC orders as well.⁶

Sometimes, connectivity between the trading firm/technology providers’ server and the exchange server is lost, which creates uncertainties for the trading firm with regard to the current status of trades that are still active in the market. Industry and regulatory reports suggest a cancel on disconnect feature, which cancels all open orders when this connectivity is lost, would alleviate this uncertainty. But, vendors pointed out that not all exchanges monitor whether connectivity between the two servers is lost and for those that do, the policies regarding what actions are taken by the exchange when the cancel on disconnect functionality is activated varies. For example, some exchanges delete all working orders including GTCs and GTDs and some only delete working GTD orders.

Trading platform vendors also provide application programming interfaces (APIs) that enable their clients to write their own algorithms. When asked if there were any controls at the API level that could detect an out of control algorithm, trading platform providers responded that it is up to the end users to develop such controls in their applications. But, some vendors provide controls within the API to prevent looping.⁷

Risk Management Platform Providers

High speed trading firms either build or buy risk management platforms to manage their trading activity and their open positions on a post trade basis. Some firms may also use vendor provided risk management software as an independent valuation of their proprietary risk systems. Risk platforms usually calculate risk based on open positions. However, some vendors do not include working orders, which may result in trades, in these calculations.

A common misperception may be that all risk management platforms have the capability to analyze risk in near real time (within microseconds). In fact, some risk management platforms may take a few minutes to calculate VaR and Greeks for options.⁸ Other risk platforms may take up to 10-15 minutes to receive data from multiple trading venues and sources, including information on OTC and obscure products.

Data Providers

Data vendors provide trading firms with various types of market information that can be used to make trading decisions and to analyze risk. Because inaccurate data have the potential to adversely impact trade generation and risk analytics, vendors may use various techniques to normalize corrupt data, such as comparing information across multiple sources and using truncation techniques for outliers.

Co-location/Proximity Hosting Providers

Co-location/proximity hosting providers enable trading firms to access many business partners like exchanges, telecommunication and power companies, leasing agents, network engineers, data and risk management platform providers, etc. inside the same facility with minimal latency (time delays) and serve as a single point of contact to manage these relationships. Typically, the difference between co-location and proximity hosting services relates to the geographic distance between the trading firm's server(s) and exchange server(s). At co-location sites, trading firms place their server(s) within the same facility where the exchange server(s) is located. At proximity hosting sites, trading firms place their server(s) geographically near but not within the same facility as exchange server(s). Both the co-location and proximity hosting providers noted that in recent years there has been a migration from single (e.g. equities) to multiple-asset (e.g. equities, futures, options, foreign exchange, etc.) trading and many firms now trade at multiple exchanges globally.

What keeps technology providers awake at night?

When asked what issues keep them awake at night, trading platform providers raised a variety of issues. Understandably, some were concerned about the ongoing reliability and quality of their systems. At the outermost extreme, one vendor worried about a software bug that could create catastrophic conditions in the market. Other issues mentioned include exchange rebate models being unsustainable, emerging markets rather than U.S. markets driving future growth, need for regulators to define standards but not over regulate markets, and ways clearing firms manage risk parameters.

Risk management platform providers communicated other concerns such as the inadequacy of risk controls at some of the smaller trading firms entering the market and the fundamental difference between trading products with deep liquidity like S&P futures and less liquid products like coffee or cocoa during night trading. For example, a large order (sweep order) in a soft commodity at midnight, whether intentional or otherwise, could significantly move the market during volatile market conditions.

How do they envision high speed trading evolving over the next few years?

Technology providers were also asked how they saw high speed trading evolving over the next few years. One trading platform provider mentioned that speed and co-location would inevitably become commoditized. With speed becoming ubiquitous, profitability going forward will likely be dependent upon new and better trading strategies. Other platform providers indicated that while more firms are automating their trading processes, screen based point-and-click trading may never fully go away. In the future, however, point-and-click trading may decrease in North America and increase in other regions like Asia, Africa, and South America.

Co-location providers indicated high speed trading continues to expand but one said this growth is being driven by institutional demand, arising from brokers automating trades that previously were conducted over the phone, rather than by proprietary trading firms. Nevertheless, high speed trading may eventually reach a saturation point in the U.S. and other markets may follow later.

Like co-location providers, risk platform providers also indicated that over time high speed trading may decline as the ability for these traders to sustain a competitive advantage becomes cost prohibitive. Undoubtedly, developments on the regulatory front will have an impact on high speed trading. Therefore, vendors cautioned regulators to be careful not to implement regulations that disadvantage U.S. markets or have knock-on effects.

One risk platform provider questioned whether clearing firms have sufficient risk controls in place to contain the risks associated with high speed trading and to shoulder the magnitude of losses that could arise from it. Replicating the dynamic that existed in open-outcry markets, where a collective human intelligence slowed the markets down and determined the next move during times of uncertainty, would help today's markets considerably.

What would technology providers do if they had the power and ability to change *anything* for the betterment of the markets?

Technology providers were given the opportunity to discuss changes they would implement to benefit the markets, if they had the power and ability to do so. A trading platform provider spoke unfavorably of trading venues that offer different infrastructure connectivity to matching engines such as slower price feeds on one network and faster order matching on another, with the faster network being provided at a higher cost. Another advocated for more market transparency and the elimination of over the counter trades.

One co-location provider mentioned everyone wants a better trading environment and tighter risk controls but controls at the exchange level are not uniform, which may be a challenge for firms trading multiple asset classes on various trading venues. A second was concerned about competition arising from exchanges offering co-location services and said such behaviors could tend to be monopolistic. For example, co-location sites at some trading venues can only be accessed using one or two telecommunication networks, whereas this vendor offers its customers a choice of nearly 100 telecommunication providers.

One risk platform provider wanted a mechanism that would slow the markets during times of extreme volatility and price movement. Another advocated that trading firms should have integrated risk management platforms that work in real-time. The third wanted increased fungibility and deliverable supply of products, price transparency, and trading firms to reconcile the information they receive from exchanges on filled orders to the information they receive from their clearing member on filled orders to ensure there is no discrepancy between the two.

What are technology providers' concerns from a regulatory perspective?

Some common themes were voiced when technology providers were asked about their regulatory concerns. One trading platform provider said that much of the language and intent of the new reforms with regard to firms that access the markets directly was not written in a way that was understandable to their employees, including compliance and legal staff, and that liquidity could migrate to countries with less regulation. Another stated that although best practices for high speed trading exist, regulators should define rules and standards for this practice using a balanced approach that does not over regulate the markets. Similarly, one co-location provider said excessive regulation following the 2008-2009 down turn could result in more harm than good. One risk platform provider said regulators need to define best practices for risk management controls and penalties for non-compliance.

Conclusion

In summary, interviews with technology providers highlight a number of important issues that arise at various levels of the trade life cycle. Risk management occurs within a tiered structure where clearing firms and their non-clearing customers each have responsibilities for setting and administering risk limits. But, the types of risk controls that vendors offer vary.

During the interviews, concerns were raised that some clearing firms may be relinquishing the administration of risk controls to their non-clearing customers in an effort to gain more business, clearing firms with insufficient risk controls may not be able to shoulder the losses that could arise from their high speed trading customers, and some small non-clearing firms entering the market may not have adequate risk controls in place. Countering the latter claim, however, another vendor said trading firms always use some type of pre-trade risk controls like price and order limits. Therefore, regulators should ascertain if some clearing firms are indeed relinquishing the administration of risk controls to their non-clearing customers as inadequate controls could lead to losses by the clearing firm. Regulators should also review clearing firms' methodology for establishing pre-trade limits as these limits could be set so high that they are ineffective and circumvent the reason that they are in place. Lastly, regulators should coordinate policies on risk controls for firms that access the markets directly to prevent regulatory arbitrage.

A number of other issues were raised that impact firms' ability to control risk. The speeds at which risk management systems can calculate risk is dependent upon how frequently trading venues provide data to trading firms. Trade information for OTC and other thinly traded products may take trading firms 10-15 minutes to receive. Firms that trade on multiple trading venues and/or use multiple vendors may face increased risk management challenges because pre trade controls are not uniform. In addition, actions that are taken when automatic kill and cancel on disconnect functionalities are activated vary by vendor and by trading venue. Vendors also typically do not provide trading firms with the ability to detect an out-of-control algorithm, so firms need to build these capabilities within their programs. Not all risk management platforms take working orders into account when they calculate risk. Therefore, vendors that supply and trading firms that build risk platforms may want to consider the costs and benefits of including working orders in their risk calculations.

When discussing current and anticipated future market conditions, technology providers continue to see growth in high speed trading, but one said this increase is now being driven by institutional demand rather than by proprietary trading firms. However, some vendors predict high speed trading will eventually reach a saturation point.

Technology providers also expressed a number of other concerns related to the sustainability of trading venue rebate models, emerging rather than U.S. markets driving future growth, and large orders in less liquid commodities having the capability to move the markets during night trading.

Some technology vendors believe there is a role for regulators to define best practices for risk management and penalties for non-compliance. But, regulators need to clearly communicate these guidelines as one provider said that the language in recent reforms with regard to firms that access the markets directly was not understandable even to its compliance and legal staff. Finally, regulators were cautioned that any new regulations should not impact the competitiveness of the U.S. markets or have unintended consequences.

¹ Risk controls include the processes, procedures and systems a firm needs to prudently manage all the risks resulting from its trading activities to ensure they are within the firms' risk appetite.

²See: FIA Asia (2007), "Profile of exchange and fcm risk management practices for direct access customers," December 3; OICU-IOSCO (2008), "An overview of the work of the IOSCO technical committee," July; OICU-IOSCO (2007), "Multi-jurisdictional information sharing for market oversight," April; FIA (2009), Letter from John Damgard to Greg Tanzer, IOSCO, May 26; FSA (2008), *Market Watch*, November, Issue no. 30, pp.10-13; FIA-FOA (2009), Clearing Risk Study; OICU-IOSCO (2009), "Policies on direct electronic access," February; FIA (2010), "Market access risk management recommendations," April; OICU-IOSCO (2010), "Principles for direct electronic access to markets," August; FIA (2010), "Recommendations for risk controls for trading firms," November; SEC (2010), "Risk management controls for brokers and dealers with market access," Release No. 34-63241; File No. S7-03-10, November; CFTC (2011), "Recommended practices for trading firms, clearing firms and exchanges involved in direct market access," Pre-Trade Functionality Subcommittee of the CFTC Technology Advisory Committee, March.

³ Definitions for clearing and non-clearing members can be found in: Clark, Carol 2010, "Controlling Risk in a Lightning Speed Trading Environment, Federal Reserve Bank of Chicago *FedLetter*, March at http://www.chicagofed.org/webpages/publications/chicago_fed_letter/2010/march_272.cfm

⁴ This comment was made before SEC Rule 15c3-5 went into effect in July 2011.

⁵ For example, if a trading firm has an overall position of 500 buy contracts, the kill button will sell 500 contracts and flatten the position.

⁶ GTD (good till date orders) are non-persistent order types that are only valid for the trading day. At the end of the trading day these orders get cancelled by the exchange. GTC (good till cancel orders) are persistent order types that do not get cancelled by the exchange at the end of the trading day. GTC orders are generally cancelled by the trader/trading firm/clearing firm, but some exchanges set limits on how many days a GTC order can stay in the market.

⁷ An algorithm is said to be looping when it keeps iterating the same action over and over. For example, a looping algorithm may be used to buy 1,000 shares 10 shares at a time. However, an undetected out of control looping algorithm has the potential to bankrupt a trading firm and, depending on the severity, potentially impact the markets.

⁸ VaR (Value at Risk) is a widely used risk measure of the risk of loss on a specific portfolio of financial assets. Greeks are the parameters that represent the sensitivities of the price of derivatives, such as options, to a change in the underlying parameters on which the value of an instrument is dependent.