Quant Invest Chicago 2011 Keynote Address
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Prepared for Bryan Durkin

Thank you, Keith, for that kind introduction. It is such a pleasure to be here today with so many of our valued customers in the audience.

I was asked to provide an exchange perspective on high-frequency trading and, more broadly, algorithmic trading. To provide just some very brief context around my point of view, as many of you know, CME Group is a leading and very diverse derivatives marketplace.

- We operate highly efficient derivatives markets with deep liquidity and low execution costs.

- Our products are industry benchmarks, the most diverse product line of any exchange – we trade interest rate products such as Eurodollars and U.S. Treasuries, equity index products, foreign exchange, energy and metals products and agricultural commodities.

- We have a transparent and open market structure. And I think it's important to note that we have a very diverse and global customer base that includes, among others, banks, hedge funds, asset managers, corporations, commercial producers and merchandisers, intermediaries and proprietary trading firms.

- More than 85 percent of our business is transacted electronically on a highly scalable electronic trading platform, CME Globex, which operates virtually 24/7 and is distributed to 150 countries.

- CME Globex provides a transparent, level playing field for all participants, with non-discriminatory access to the same connectivity options at the same prices, depending on their business needs.

- Anonymity of traders and firms is protected on all bids, offers and execution reports; and those bids and offers are available to all participants and matched according to transparent algorithms.

- I also would be remiss to leave out some performance measures of CME Globex. In the last four years, we have grown from more than 1 billion orders processed per month to more than 5 billion per month.

  At the same time as that five-fold increase in order volume, our average response times at the match engine have decreased from more than 50 milliseconds in 2006 to just 4.6 milliseconds in 2010.

- CME Group also recently completed a new state of the art 428,000 square foot data center facility in Aurora - which houses our CME Globex match engines - as well as our co-location services which are launching early next year. These hosting, connectivity and support services will provide the lowest latency connection and maximum reliability for our customers.

- In addition to these strengths in electronic trading, we also operate two very active trading floors, one in New York and the other in Chicago.

- We have a very strong track record of innovation and customer service, and we are a global partner of choice for exchanges around the world who are looking to broaden the distribution of their products and leverage our technology capabilities to help them do that.

- Lastly, we also are unique in that part of the value we provide to our customers is our industry-leading central counterparty clearing services.
  - We have strong track records clearing both listed and over-the-counter derivatives.

- And in more than a century of operations, no customer has ever lost money due to a clearing firm default.

We are a leading derivatives marketplace. Because our customers have the ability to transfer their risk in our markets, they can trade more goods. Write more loans. Fly more flights. Businesses grow and economies expand because of the risk management capabilities offered at CME Group.

So with that background in mind, let's move to the topic of how exchanges deal with high-frequency trading. This is a big topic, so I thought
I might start by boiling this down to just two key points that I want you to walk away with.

First, let me assure you that our exchanges value your participation in our markets. There is considerable evidence that high frequency traders increase liquidity, narrow spreads and enhance the efficiency of markets. And rather than vilifying this group, as some have sought to do, we believe we should establish market structures that promote - rather than discourage - your participation.

Second, we take very seriously our responsibility to provide risk mitigation technology and to protect the integrity of our markets. We have a number of existing self-regulatory systems, measures and controls which exist to mitigate the risk of disruptive activity and allow us to monitor the activities of market participants to ensure compliance with our rules.

Before regulators impose additional regulations on high frequency traders that undermine liquidity and harm the markets, we believe they need to appropriately identify the problem that needs a solution rather than simply assert that speed and automation are somehow a menace to the markets. As I suggested in a recent speech at Georgetown University, we'd be well served to first understand what has gone *right* with the evolution of algorithmic trading before taking actions that will impair the efficiency of price discovery and risk management.

Today I want to spend most of my time talking about striking the right balance. How do we facilitate algorithmic traders who enhance the quality and efficiency of markets, while at the same time structure our markets to effectively deal with the risks and complexity of automated trading?

HFT Value
I'd like to spend a little time talking about why we are convinced that high frequency trading and other forms of algorithmic trading are valuable to markets and market participants.

I think we can all agree that, although these terms often are given a bad rap, they represent the natural evolution of markets from an open-outcry-based model to a computer-based model. The result, as I mentioned earlier, is that algorithmic and high frequency trading have grown, contributing significant volume and providing greater liquidity, tighter bid/ask spreads and, as most studies suggest, less volatility. Additionally, algorithmic trading has improved operational efficiency and productivity and allowed for the processing of more data more quickly to optimize execution quality. The liquidity you generate clearly improves market quality and trading tools you have developed are increasingly relied upon by all segments of market participants to enhance the quality of their executions.

And you don't just have to take my word for it.
CME Group undertook a number of reviews to determine the impact of high frequency and algorithmic trading on our markets. In one study, we examined the link between the proportion of algorithmic trading activity, liquidity, and volatility over a two-year period in a number of products, including, the E-mini S&P 500 futures, Euro FX futures, Eurodollar futures, 10-year Treasury note futures and crude oil futures (all nearby month except for 5th month Eurodollar). We reviewed the relationship between the proportion of daily volume contributed by algorithmic traders and the average bid/ask spread during regular trading hours.

Our results concluded that, in the majority of markets reviewed, algorithmic trading volume was positively correlated with narrower bid/ask spreads, increased depth of market and reduced volatility. In fact, another

study we did in the E-Mini S&P showed that ATSs accounted for nearly 60% of the lead month liquidity measured by their resting side volume share.

The collective research broadly underscores the fact that algorithmic traders are significant providers of liquidity, particularly when acting in a market-making capacity.

I also will just briefly mention one other important piece of analysis because of the misinformation we often see and hear on this issue– and that is that we found no evidence to support the assertions that high frequency trading contributed to the flash crash on May 6th last year.

Our Risk Management View

As I mentioned, there is always a balance between recognizing the value of the automated trading that those in this room do and ensuring that exchanges and market participants have the systems in place to manage risk in a marketplace that is increasingly automated. And it is very critical for all of us that we get this right.

As technology in financial markets continued to rapidly evolve over the past five or so years, algorithmic and high frequency trading has become increasingly significant in the context of order flow and transactions executed on CME Globex. During that same period, order messaging, transactions and market data messaging have all grown exponentially.

CME Group has developed numerous risk management processes, procedures and systems to preserve the integrity of its markets in light of the many risks associated with maintaining a primarily electronic and increasingly automated market.

For example, CME Group markets are the only exchanges in the world that require pre-execution credit controls which became mandatory for use by clearing members in June 2010, and we developed them in a way that did not introduce additional order processing latency. Clearing Firm Risk Administrators are able to select automated real-time actions if the established risk limits are hit, including e-mail notification, blocking of non risk-reducing orders and the cancellation of working orders; the Administrator can also set levels at which early warning notifications will be automatically generated.

Additionally, CME Globex employs a number of automated risk management functionalities at the match-engine level that are designed to prevent potential problems which may result from electronic trading, including algorithmic and high frequency trading. I'd like to very briefly walk you through some of these as well.

- Let's start with stop logic functionality, which serves to mitigate artificial market spikes that can occur because of the continuous triggering, election and trading of stop orders due to insufficient liquidity. If elected stop orders would result in execution prices that exceed pre-defined thresholds, the market automatically enters a brief reserve state for a predetermined time period, ranging from five to twenty seconds.

  During this period, no orders are matched but new orders other than market orders may be entered and orders may be modified and cancelled. The momentary pause that occurs when Stop Logic is triggered allows market participants the opportunity to replenish liquidity and allows the market to regain equilibrium, thereby mitigating the potential for disruptive market moves. This functionality was broadly credited with stemming the broad market decline on May 6th.

- Dynamic price banding functionality prevents the entry of erroneously priced orders such as a bid at a price well above the market - or an offer at prices well below the market which could trigger a sequence of market-moving trades that require subsequent cancellations.
  In order to determine the level of price banding, CME Group markets use the most current and relevant market information to establish the reference price from which the bands are set - for futures, we may use trades, best bid and offer, implied bid and offer or indicative opening price, and for options, last price of an option or spread or a theoretical options price based on options pricing

algorithms.

- Next, protection points for market and stop orders. A limit price, or protection point, is automatically assigned to futures market orders and stop orders to preclude the execution of these types of orders at extreme prices in situations where there is insufficient liquidity to support the execution of the order within an exchange-specified parameter of the current market.

  Unlike the securities markets on May 6th, where more than 20,000 trades executed at grossly distorted prices were canceled, CME Group did not cancel any trades.

We also have maximum order size protections on Globex that reject the entry of an order into the trading engine which exceeds a pre-determined quantity. This functionality provides protection against the disruptive impacts of "fat finger" quantity errors. CME Group also employs automated messaging volume controls that automatically reject messaging that exceeds an established message per second threshold over a rolling three second window, helping to mitigate the impact of a malfunctioning algorithm on the market.

All of these types of automated exchange controls are critical to protecting the integrity of the markets and CME Group has continued to innovate in this space as electronic trading has evolved and will continue to do so. It is equally important, however, that clearing firms and trading firms also have proper risk management controls and ensure that they have in place and execute appropriate protocols for testing and supervision of their automated trading systems.

In addition to its automated risk and volatility mitigation tools, CME Group also employs very significant human and technological resources throughout the company to help ensure the integrity of its markets. Our Globex Control Center, Clearing Risk Management and Market Regulation groups are all focused on this mission.

Our Market Regulation group, for example, anticipated the explosive growth in messaging and designed systems infrastructure and applications to capture the full-range and contextual-support dimensions of all electronic activity. This highly granular data includes identifying elements such as the executing firm, operator ID and account number and whether the user is employing an automated trading system, as well as order details and numerous time stamps calibrated to the millisecond. Tools to efficiently mine and aggregate that data with exceptional speed are available to all regulatory analysts and allow for the querying of real-time and historical data.

In addition, Market Regulation employs sophisticated systems to profile markets and participants, review and analyze participants' positions, generate live anomalous position and volume alerts, replay markets, and identify transaction or order entry patterns that may be indicative of misconduct.

The systems employed by Market Regulation provide its 150 employees with tremendous flexibility in analyzing market activity, including the activity of algorithmic and high frequency traders, at the most granular level.

Continuous market surveillance and administration is also performed by our Globex Control Center, or GCC, which provides front-line customer service and market operation support for all electronic trading on CME Globex. The GCC uses a variety of both proprietary and third party vendor tools to monitor and support real time trading.

In short, we recognize that market integrity is a cornerstone of our business model and we work hard to continually protect and enhance it.

Recommendations

I would like to turn now to recommendations, and I'd like to offer these in the context of recent recommendations that the Joint CFTC SEC Advisory Committee made regarding high frequency trading

post-flash crash.

Two key lessons of May 6th are first, that uncertainty damages liquidity provision, and second, that closely linked markets should have coordinated halting mechanisms. The single-security circuit breakers in place today and the new ones proposed neglect both of these lessons.

There are, in our view, more effective and market-efficient solutions to achieving the objectives of single security circuit breakers that pose significantly less risk of causing collateral distress to the markets and to market participants.

So, what do we recommend? Two key points.

First, we believe that coordinated and appropriately calibrated market-wide circuit breakers are a critical step. Today, the circuit breaker rules are triggered based on percentage moves of 10%, 20% and 30% in the Dow. None of those percentages were reached on May 6th, but clearly a lesser move than 10 percent, coupled with the speed of today's markets, severely roiled the markets and challenged investor confidence on that day.

CME Group therefore believes it would be prudent to promptly re-evaluate the current construct. We recommend lowering the circuit breaker thresholds to levels that would remain infrequently triggered, but would also better protect the market and sustain the confidence of market participants in a period of instability. For example, intraday moves of 5-7% in the major indexes are still very rare – they have occurred one to three times every four years since 1962, but would provide a more appropriately calibrated initial pause that would allow market participants time to revaluate market conditions before the move becomes a crisis that threatens the market's infrastructure.

Additionally, given today's highly automated market structure and sophisticated information processing technology, less lengthy halts are necessary to allow the market to assimilate information, assess risk and mobilize liquidity. Rather than trading halts of 30 minutes to 2 ½ hours, we believe the initial halt could be reduced to 5-15 minutes and subsequent Halt periods narrowed to no more than 30 minutes.

The Joint CFTC SEC Advisory Committee also has come out in support of single security circuit breakers for the Russell 1000 stocks and actively traded ETFs that were implemented by the securities exchanges after the May 6th flash crash and the national securities exchanges have recently proposed new rules that would modify these circuit breakers and augment them with limit up/limit down price banding. We believe there are important unintended consequences with this approach, as the imposition of single security circuit breakers actually *increases* uncertainty and instability in the market during very volatile conditions.

Many of the ETFs subject to single security circuit breaker rules are based on indexes that also underlie other financial products. Consequently, single security trading halts that would apply to ETFs on broad-based indexes would not be coordinated with the market-wide circuit breakers or with the price limits that currently apply to related index futures and options.

In a macro-market event, multiple constituent stocks in an index could be halted without a market-wide circuit breaker being triggered, and individual stocks would be halted and opened on staggered timelines, creating complexity and confusion in understanding the index calculation and the true value of the index.

Our second recommendation is that, instead of single-security circuit breakers, we collectively implement automated functionality around price banding, protection points, and volatility mitigation to address the impact of transitory liquidity gaps.

Additionally, given the disruption and uncertainty that erroneous trades create, greater efforts must be devoted to implementing automated controls to *prevent* erroneous trades and implementing clearer and more effective policies for addressing error trades when they do occur.

As I noted earlier, on May 6, CME Group did not cancel or price-adjust any trades in our equity index futures

complex, primarily because we had automated mechanisms introduced at the trading engine level to mitigate the likelihood of erroneous trades occurring. The absence of these mechanisms on other venues resulted in thousands of canceled trades and these aberrant prices exacerbated uncertainty and left market participants exposed.

Lastly, the Joint Advisory Committee has endorsed the establishment of clear rules regarding trade cancellations. We have recommended that such rules should have a bias toward repricing rather than cancellation as we believe our experience shows this approach enhances trade certainty and mitigates exposure, both of which heighten market confidence and support the provision of liquidity.

This practice is less disruptive to markets than busting trades and is broadly supported by market participants. We need to be mindful as well of the fact that participants lay off position risk across markets. Therefore, decisions by one market center to cancel trades can leave participants exposed in other markets, potentially creating reverberating repercussions in the other markets. Price adjustment policies remedy this concern.

A Final Word

As we look ahead, speed will unequivocally remain a defining characteristic of financial markets.

At CME Group, we recognize this and are committed to ensuring that we employ effective risk, volatility and error-mitigation functionality to support high-frequency trading activity in ways that benefit all market participants. And, of course, it's incumbent on high frequency traders to do the same.

Clearly, the margin for error in today's regulatory environment is very small. That being said, rules and market structures that restrict or impair the participation of high frequency traders will result in less efficient and less liquid markets and, ultimately, that serves only to harm those the regulators seek to protect. In the end, we know that liquidity is arguably the best defense against disruptive markets and we need to promote rather than impede liquidity.

Thank you for your time and attention this afternoon. On behalf of CME Group, we look forward to working with all of you to continue to improve financial markets for the benefit of investors here in Chicago and around the world. I look forward to addressing any questions you may have.