Ms. Melissa D. Jurgens
Secretary of the Commission
Commodity Futures Trading Commission
Three Lafayette Centre
1155 21st Street NW
Washington DC 20581

Re: CFTC Concept Release – Risk Controls and System Safeguards for Automated Trading Environments
RIN 3038-AD52

Dear Ms. Jurgens,

We are pleased to provide our comment on the CFTC's concept release for Risk Controls and System Safeguards for Automated Trading Environments. We are market design researchers with academic and practical experience in a wide variety of market design contexts. The market design approach assumes that participants in a market act optimally in their rational self-interest with respect to market rules, but takes seriously the possibility that the market rules themselves may be sub-optimal.[1] We believe that this approach brings a useful perspective to the issues you raise in the concept release. In particular, it avoids the "is HFT good or evil?" debate, which we think is often counterproductive, and instead focuses attention on whether the current market design is optimal.

Our research suggests that the ongoing arms race amongst HFT firms – in which large sums of money are devoted to seemingly trivial speed improvements (sometimes measured in millionths of seconds) – is a *symptom* of a basic flaw in modern financial market design: continuous-time trading. We begin by showing that the continuous-time limit order book does not actually work in continuous-time: market correlations completely break down at high-frequency time horizons, which creates technical arbitrage opportunities available to whomever is fastest, inducing an arms race for speed. We then show that the arms race has two kinds of negative effects: it is socially wasteful, and it harms liquidity. The arms race and these negative effects are thus a consequence of flawed market design.

As an alternative, we recommend frequent batch auctions – *uniform price sealed-bid* double auctions conducted at frequent but discrete time intervals, such as once per second (or even once per 100ms). We show that frequent batching has two kinds of benefits relative to continuous trading. First, it stops the arms race (intuitively, if trading is just once per second, then microsecond speed improvements are much less valuable). Second, it transforms competition on speed into competition on price (intuitively, if there is new public information that many algorithmic trading firms observe at roughly the same time, firms will compete over who is willing to pay the most or sell for the least instead of competing over who can respond the fastest). Consequently, frequent batching leads to greater social welfare and improved liquidity.

[1] As Milton Friedman wrote over fifty years ago in Capitalism and Freedom: "The existence of a free market does not of course eliminate the need for government. On the contrary, government is essential both as a forum for determining the 'rules of the game' and as an umpire to interpret and enforce the rules decided on." More recently, the Nobel Prize in Economic Sciences was awarded in 2012 to Alvin E. Roth for his work on market design.

Our arguments are detailed in our paper, "The High-Frequency Trading Arms Race: Frequent Batch Auctions as a Market Design Response," which is attached. Here, we emphasize a few points that may be especially relevant to regulatory policy and implementation.

First, the change to frequent batching can be viewed as a backend, technocratic reform to market design that directly addresses an observed problem of the continuous-time limit order book market: the speed race. Exchanges would appear to operate essentially as they do today with the exception that orders would be accumulated over the batch interval before they are processed in batch at the clearing price, all in about the blink of an eye. Ordinary investors might not even notice the difference. Sophisticated algorithmic trading firms would continue to play a critical role in financial markets.

Second, batching helps fundamental investors by improving liquidity via deeper markets and narrower spreads. We show that the resources invested in the speed race ultimately come out of the pockets of investors, as opposed to HFT firms, via increased trading costs due to thinner markets and wider-than-necessary spreads. Unless one is willing to argue that waiting a second (or 100ms) is very costly for fundamental investors, batching makes fundamental investors better off.

Third, as we discuss in Section 8 of the paper, frequent batching has several potential market stability benefits. First, frequent batching is computationally simple for exchanges. Exchanges have a discrete block of time to compute and report the auction outcome, which prevents order backlog and incorrect time stamps. Second, batching gives trading algorithms a discrete time period to process current prices before deciding on future trades. There is no incentive to trade off code robustness for speed. Third, changing from continuous time to discrete time improves the regulatory paper trail. And fourth, the greater market depth from batching suggests that the market is apt to be less vulnerable to mini flash crashes.

A fundamental source of stability problems with continuous markets is that they implicitly assume that computers and communications are infinitely fast. Computers are fast but not infinitely so. Frequent batching respects the limits of computers.

We would be happy to provide any additional information or help that you may desire on this topic.

Sincerely yours,

Eric Budish, University of Chicago

Peter Cramton, University of Maryland

John Shim, University of Chicago

Attachment: Eric Budish, Peter Cramton, and John Shim, "The High-Frequency Trading Arms Race: Frequent Batch Auctions as a Market Design Response," University of Chicago, December 2013.