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# **Minimum quote life and maximum order message-to-trade ratio**

**Economic Impact Assessment EIA1**

Foresight, Government Office for Science

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# Minimum quote life and maximum order message-to-trade ratio<sup>1</sup>

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## **I. Title of proposed measures**

Order Book Activity Restrictions:

1. Minimum quote life.
2. Maximum order message-to-trade ratio.

## **2. Objective**

This Regulatory Impact Assessment studies the impact of the proposed Order Book Activity Restrictions. The aim of the proposed measures is to meet the goals of the Markets in Financial Instruments Directive (MiFID). These goals are summarized in the proposal:<sup>2</sup>

Conceptually, MiFID is predicated largely on markets in shares, in which regulated exchanges have traditionally been playing a central role. The emergence of alternative trading functionalities, rapid technological developments, and the growing spotlight on OTC trading all challenge this paradigm. It is therefore necessary to update the Directive to provide a more suitable, clear, and robust regulatory coverage of all different types of trading facilities, technological applications, and methods of execution which exist today or may emerge in the foreseeable future. Together with the considerations below on improving pre- and post-trade transparency in both equity and non-equity markets, providing for the comprehensive consolidation of market data in the more fragmented and competitive trading environment generated by MiFID, as well as enhancements to investor protection and supervision, these changes aim to support market liquidity and efficiency, and improve investor confidence.

In particular, the proposed Order Book Activity Restrictions are an attempt to increase market liquidity and improve investor confidence in a way that will not harm other measures of market quality.

## **3. Background**

It is socially valuable to have prices accurately reflect the true value of financial assets—this efficiently allocates capital and allows risk to be more accurately examined. Equities and other financial assets trade on exchanges that allow for continuous price updates. Price information can come from trade or from quote data. In recent years trade and quote volume has increased. During this time quote traffic has risen substantially more than the number of executed trades, leading some observers to worry that quote traffic may be too high. That is, there is some socially optimal level of quoting activity that has been surpassed. While having prices that more rapidly incorporate information is valuable, higher quote traffic may impose additional costs and may not significantly aid price discovery. For example, an increasing

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<sup>2</sup> European Commission – Directorate General Internal Market and Services. Public Consultation: Review of the markets in financial instruments directive (MiFID). December, 2010.

amount of capital is required to handle the additional messages. It may be that the amount of capital being allocated is above the socially optimal level.

The increase in quote traffic has been driven by the rise of algorithmic trading. Algorithmic trading, and especially high frequency trading, has become a dominant part of financial markets. Algorithmic trading refers to the use of computers to automate the investment process. Algorithmic trading has no minimum investment horizon – a position may be held for years, days, or milliseconds. The fastest (in terms of their typical holding period) algorithmic traders, are referred to as high frequency traders. There is no definitive holding time interval that makes a market participant a high frequency trader, but generally the criteria implies a sub-minute average holding period and perhaps even a sub-second holding period.

In the distant past, trading was carried out face-to-face between human market participants with minimal technological involvement. Traders would gather in a centralized location, such as the New York Stock Exchange (NYSE) floor, and would verbally broadcast their desired orders, with a NYSE Specialist helping intermediate trades. No longer. Program trading, which has been around at least since the 1980s, was an early form of algorithmic trading whereby baskets of stocks were systematically bought or sold together. Since its introduction, the role of algorithmic trading in market making, arbitrage activity, and order execution has steadily risen. Now most trades are done via remote participants through electronic markets. Often times computer programs generate the order messages. Even when human market participants determine which asset to buy or sell, they frequently utilize computer randomization algorithms that slowly parse an order into the market to optimize order execution.

How have markets transformed as technology has evolved? It is difficult to say precisely, but during the rise of the machines the way orders entered markets did change: the size of orders decreased, the time orders remained on the limit order book decreased, and the number of orders increased. The new market environment may be one where medium-sized market orders can deplete the order book, causing security prices to experience sizeable price-pressure induced movements. If so, additional regulatory requirements that increase liquidity may benefit market participants.

One objective of MiFID is to “support market liquidity and efficiency, and improve investor confidence.” To achieve this goal it is important to optimize the functionality of the order book. Many electronic markets do not specify in detail how market participants must conduct themselves on the order book or how they can engage with other market participants. That is, most financial markets do not have limits on how long an order must rest on the order book or how frequently a market participant’s order messages must translate into trades.

It is amidst this trading environment history and the current relatively unhindered order book in which new order book activity measures have been proposed. The proposed rules implicitly assume that the current quote activity is beyond the socially optimal level, that unrestricted order book activity results in the misallocation of resources, or that it is a suboptimal way to provide liquidity. The remainder of this Regulatory Impact Assessment will assess the impact of the proposed measures in terms of costs, benefits, and risks.

## 4. Risk assessment

The risks associated with the current market structure without the proposed measures are outlined below. Most of the concerns existed in financial markets before the introduction of algorithmic trading, but there is a concern that automation has exacerbated the issues.

1. No time restriction for orders. The current rules on market microstructure do not require market participants to leave orders on the order book for any minimum period of time.
  - Human Market Participants – With the advancements in computing power and the adoption of technology by financial trading venues, some market participants invest heavily so as to be able to observe, analyze, and react to information in milliseconds. It takes a human market participant significantly longer just to enter an order, even after having received the relevant data. The risk is that human market participants may desire to enter or exit a position at a specific price by entering a market order, but that the execution price will change significantly between when the human market participant sees the desired security price and when the market order is received by the trading venue. While not a new problem, there may be a sense that the problem has escalated since computers can react much quicker than human market participants.
  - Illusion of Depth – The ability to enter an order and withdraw it in milliseconds may result in the illusion of depth. In the current market environment if several market orders hit a financial asset that appears to have many limit orders near the inside price, there is no guarantee that the apparent market depth will still be available on the order book after the first trade executes but before the second one arrives. If this is the case, displayed depth may overstate the true depth.
  - Adverse execution costs – Related to depth is the concern that a market participant is unable to enter or exit an investment position without significantly moving the price. Over the last several years traders have been breaking their trades into several small orders and routing them in to the market through a volume-weighted average price formula or an alternative order algorithm in an attempt to mask a market participant's trade intentions. Even so, some market participants still claim they are unable to change their investment position without impacting prices. These costs could be perversely increased by regulation that causes liquidity providers to leave the market.

No order-to-trade ratio requirement. The current market structure rules do not require a market participant to monitor his ratio of orders to trades. Several financial trading venues receive many more quotes than trades. Partly this is because providing a quote gives other market participants a free option to trade against the quote. As quotes may become outdated due to new information arriving, a high quote-to-trade ratio is not surprising.

- Misallocation of Resources – Currently most financial trading venues do not charge market participants to enter, cancel, or change a limit order. Exchanges bear a

small cost to process each limit order message. Exchanges have the capacity to handle one firm sending several limit order messages in a short time period for a handful of assets. However, latency delays have been reported when message traffic surges. Such delays were reported during the May 6, 2010 Flash Crash and are rumored to have overwhelmed some exchange servers, exacerbating the level of uncertainty and confusion during the temporary crash. In addition to the investment exchanges must make to handle the quote traffic, market participants must also increase their computing systems if they want to track intraday prices and liquidity.

- “Game-Playing” – Some market participants have been accused of manipulating prices through their order book activities. To date, at least one firm in the U.S. equities market, Trillium Trading, has been charged with order book market manipulation for engaging in “layering.” Layering refers to the illegal activity of entering a hidden order on one side of the order book followed by several visible limit orders on the other side of the order book. The idea being that the visible limit orders influence other market participants to move the bid and offer in the desired direction until the hidden order is executed. Once the hidden order executes, the market participant engaging in layering immediately removes the displayed limit orders as they were only placed to drive prices in the desired direction and were never intended to be executed.

Market manipulation harms financial markets. It reduces price efficiency and hurts investor confidence. Asset prices in well functioning markets should reflect all known information about the value of each security. Any mispricing would otherwise lead to a profit opportunity that would quickly be arbitrated away. However, in an environment where game-playing in the order book regularly occurs, the reduced confidence in bona fide order message activity will reduce arbitrage precision and diminish price efficiency. Second, game playing in the order book can harm investor confidence. If market participants believe certain other market actors command an asset’s price, they will be less certain that their investment in the asset will be on a level playing field. That is, market participants who believe there is asymmetric information in the price direction or risk of an asset will require a higher expected return in order to compensate them for the increased probability of engaging in a losing transaction.

## 5. Options

Four regulatory implementations can be derived from the proposed measures to achieve the objectives of MiFID. These are:

1. Implement no new order book restrictions.

Require a minimum order existence time.

Impose a maximum order-to-trade ratio.

Implement both (2) and (3).

1. **Option 1 involves not implementing any new order book restrictions.** If neither of the proposed order book measures is implemented, then there are no additional details to outline.

**Option 2 involves implementing a minimum order existence time.** A minimum order existence time could either be arranged as i) a fixed bright line rule stating how long an order would have to exist as a function of stock-specific volatility, market-wide volatility, or some other time-varying criteria, or ii) as a general “reasonable” time rule. The minimum order life could range anywhere from a millisecond to a minute or longer. Longer time intervals would have a larger impact on market participants. In addition, a system of monitoring would need to be implemented. This may be done at the level of the regulator, exchange, or broker/dealer. Finally, a decision would have to be made regarding whether the new regulation would apply to all trading venues or only to ‘lit’ trading venues (i.e. traditional exchanges, as opposed to dark pools, electronic communication networks, or systematic internalizers).

**Option 3 involves implementing a maximum order-to-trade ratio.** A maximum order-to-trade ratio requires a market participant to execute at least one trade for a set number of order messages sent to a trading venue. Option 3 requires many of the same decisions as Option 2 to be made before implementation. In particular, regulators need to decide whether the ratio will be fixed, a function of a relevant market statistic, or a balancing test depending on the circumstances. The range of possible ratio sizes must be set. The lower the ratio the stronger the constraint on market participants. The institution responsible for monitoring must be designated. The affected trading venues must also be set. Calculating the order-to-trade ratio raises some nuanced complications:

- Beginning of Interval Measure. How does one determine whether the level of quote activity is appropriate prior to a firm’s first trade? Before the first trade the denominator would be zero, making the ratio undefined.
- Applicability. Who does the ratio apply to? The wider the spectrum of market participants the larger the monitoring costs.
- Taker / Maker Applicability. Are only trades where the monitored firm was providing liquidity applicable in the denominator? That is, if the market participant trades frequently as a liquidity taker, are these trades left out of the calculation?
- Shares or Transactions. Will the ratio be based on the number of shares traded and quoted or on the raw number of quotes and trades, each new message receiving an equal weight regardless of the number of shares?
- Interval of Applicability. How often will the interval be reset? Will it be considered a violation if a firm normally has a ratio below the maximum, but exceeds the allowed ratio during a relatively short interval, such as an hour or a day?
- Aggregation. Many small firms interact with the financial markets through intermediaries and it can be difficult to determine the activity of the end-user. Would the ratio be applicable to the end-user or the intermediary? Will the ratio be



applicable to each firm overall or for each firm-security traded? Would the ratio be based on all exchanges aggregating information or would there be a ratio calculated for each exchange?

**Option 4 involves implementing both (2) and (3).** The requirements of implementing Option 2 and Option 3 would be necessary to achieve the fourth option.

To determine the appropriate regulatory response a cost-benefit analysis of the alternative proposed measures must be analyzed.

## 6. Costs, risks and benefits

The costs and benefits of the proposed measures are analyzed in the following section.

1. Option 1 is to not implement any new order book restrictions, so there would be no additional costs. The potential risks of this option are presented in the Risk Assessment section above. The benefit of leaving the market structure rules unchanged is to avoid the costs associated with the proposed measures outlined below.

Option 2 is to require a minimum order existence time. The following summarizes the costs and benefits of this proposal:

- Benefits
    - (i) Increase the likelihood of a viewed quote being available to trade.
    - (ii) Align visible depth and actual depth.
    - (iii) Reduce hyper-active order book participation.
    - (iv) Reduce likelihood of short-term liquidity-induced extreme market movements.
  - Costs
    - (i) Monitoring and enforcement.
    - (ii) Reduce depth.
    - (iii) Increase bid-ask spreads.
    - (iv) Exacerbate liquidity withdrawal in volatile times.
    - (v) Reduce price efficiency.
- i) Option 2 Analysis
    - Benefits

- (i) **Increase the likelihood of a viewed quote being available to trade.** Under the current market structure of no minimum quote time a market participant may observe a quote she finds desirable, chooses to trade at the quoted price, but find that the desired quote has been removed by the time the trade executes. The quote may be removed either by a previous trade executing against the quote or by the order being withdrawn.

The potential to see a desirable price but not to be able to trade against it is not new. In modern financial markets prices do not remain static. Even when human market participants were the dominant intermediary, those desiring to buy a security could not always transact at the price announced at the time the decision to buy was made. There will always be a time delay between deciding to execute a trade and entering the order.

In the past this difference was several seconds for those on the exchange and minutes for those located off the exchange. For example, off-exchange market participants would have to call their broker and the time it took to call the broker, relay the desired trade, have the broker send the message to the floor trader, and for the floor trader to execute the order would be measured in minutes. This was still considerably faster than trading prior to the introduction of phones and telegraph messages.

The concern now is that limit orders change so fast that for most market participants the quoted price at the time of making a trade decision is not indicative of the price at which the trade will take place. Between the decision time and the execution time the initial quote will have been cancelled or replaced before most market participants are able to enter an order.

The length of the minimum quote time will determine to what degree the rule increases the likelihood that the originally viewed order will be the one in the trade execution. To provide some context, humans take between 200 – 300 milliseconds to blink. While entering a trade now is as simple as making a few key strokes, this still takes longer than 200 milliseconds. For active stocks, even the time frame of 200 milliseconds is relatively slow – several quote messages will have been received and cancelled in this time interval.

- (ii) **Align visible depth and actual depth.** As discussed in (b)(i) (Benefits) (1) for all but the fastest market participants the visible inside bid and offer quotes at the time a trade decision is made will not be the bid or offer quote when the order executes, even when no other trade occurred between the two intervals. Similarly, the depth of the order book will fluctuate. With a minimum quote time the fluctuation in the order book should decrease, but it will still fluctuate and may change dramatically between the time a market order is made and when it executes.

- (iii) **Reduce hyper-active order book participation.** If the quote activity is above the socially optimal level then it may be desirable to restrict order activity. Many securities that trade on exchanges have order books that change many times between trades. Some estimate that certain stocks experience 90 cancelled quotes for every trade. For liquid stocks, where times between trades can be measured in milliseconds, this suggests many orders exist for extremely short periods. It is difficult to identify economically meaningful information that can change at such speeds to economically justify the need for such frequent updating. The ability to revise quotes is important so as to limit the free option of execution that limit orders provide other market participants, especially when new information enters the market. There likely is a socially optimal amount of quote revision and it may be that the current amount exceeds it. By introducing a minimum quote time the amount of order updates would likely decrease.
- (iv) **Reduce likelihood of short-term liquidity-induced extreme market movements.** The U.S. Flash Crash of May 6, 2010 raised the concern that a limit order book without minimum quote times could increase the chances of precipitous price fluctuations occurring for no economic reason. If quotes can be cancelled milliseconds after being placed there is no regulatory structure preventing a large number of market participants withdrawing their orders in a short time window causing an otherwise liquid market to become illiquid. The implication being that market orders executed during the illiquid window would run through the order book and cause large liquidity-induced price fluctuations.

A minimum quote time rule would require orders to remain on the order book for a small amount longer than they might otherwise. Thus, if a short disruption in price reporting occurred on the futures market that lasted for less than the minimum quote time, then quotes posted on equity markets with a minimum quote time would be required to stay on the order book and might soak up market orders that would have otherwise depleted the order book. A contagion event could be avoided. However, the circumstances in which this would be of value are limited to the rare event where the price disruption is extremely short and trades do not run through the order book anyways.

- Costs

- (i) **Monitoring and enforcement.** Moving to a financial system with a mandatory minimum quote life requires that some entity monitor quote time horizons. The most likely candidate to do such monitoring would be the trading venues. In the same way that exchanges are able to allow different types of order messages to interact with the order book, a system could be implemented that restricts revisions and cancellations within a given time

interval after a quote is placed. Such a monitoring system would have some additional cost, but it likely would not be exorbitant.

In addition, a regulatory authority would need to occasionally verify that the minimum quote time rule was being upheld and prosecute violations. Likely this would also be a small cost given the irregular need for verification and the minimal depth of analysis required to determine an infraction.

- (ii) **Reduce depth.** In a partial equilibrium setting, requiring quotes to stay on the order book for a minimum amount of time would seem to increase liquidity depth—orders that would have stayed on the order book longer would be unaffected and there would be the additional quotes that could not be cancelled or revised as they might have been before. However, in general equilibrium the implications likely reverse – depth would decrease.

The decrease in liquidity depth as a result of the proposed measure stems from the option value of withholding a quote. While each market participant will be required to maintain his quotes for a minimum amount of time, the rate of new information creation will continue to be high. While it may be that no new information is revealed during the minimum quote time interval, there will be times when new information does arrive. Even if relevant information arrives infrequently, when it does a market participant who placed a quote a moment earlier is stuck. He will be executed against as prices move to their new equilibrium. Thus, not placing a quote leaves the market participant with the option to revise his quote in the next moment. He loses that option once his quote is placed.

By not being able to change a quote during some time interval the potential for incurring a loss increases and so market participants will be less likely to make shares available on the order book. With the proposed rule change the likelihood of being caught with an outstanding quote based on stale information increases. Market participants will reduce their liquidity provision.

- (iii) **Increase bid-ask spreads.** A similar argument as that given in Section (2)(i) (Costs) (ii) applies for the potential measure increasing spreads. Just as market participants will be more hesitant to place shares on the order book, they will also be less likely to aggressively compete for posting quotes at the best bid and offer prices.
- (iv) **Exacerbate liquidity withdrawal in volatile times.** Without a minimum order market participants can stay in the market, continuing to put in new quotes at any time knowing they can withdraw immediately from the order book if new information reveals their order price or amount of shares is outdated. During times of extreme volatility new information enters the

market more frequently. Under the current market framework market participants can update their orders regularly as new information arrives.

With the proposed minimum quote time measure, liquidity provision becomes riskier. Sections (2)(i) (Costs) (ii) and (iii) outline the reasoning for why market participants would reduce depth and be less competitive at the best bid and offer. The impetus for this is an increased probability of the market participant entering an order that becomes a loser with the arrival of new information, leaving the market participant vulnerable to entering a position at a price based on outdated information.

During times of market stress the problem is exacerbated – information and price discovery flow more quickly, increasing the probability of a quote becoming outdated. Hence, the minimum quote time regulation may have the opposite effect as intended. Instead of keeping markets liquid in volatile times, the measure likely would cause market participants to be more reluctant to place orders when they are most needed.

- (v) **Reduce price efficiency.** Price efficiency refers to the speed at which asset prices incorporate new information. The reduction in quote updates would mechanically result in security prices taking longer to integrate new information. Whether the reduced price efficiency, which would likely be small on a human scale, would have a meaningful economic implication is less clear. For instance, it is difficult to see how a delay of a few milliseconds in the incorporation of new information on prices would have any meaningful economic impact.

Option 3 is to impose a maximum order-to-trade ratio. The following summarizes the costs and benefits of this proposal:

- Benefits
  - (i) Increase the likelihood of a viewed quote being available to trade.
  - (ii) Align quoting activity with its costs.
  - (iii) Reduce hyper-active order book participation.
- Costs
  - (i) Monitoring and enforcement.
  - (ii) Reduce depth.
  - (iii) Increase bid-ask spreads.
  - (iv) Exacerbate liquidity withdrawal in volatile times.

### ii) Option 3 Analysis

The cost-benefit analysis is similar to that found in Section (b)(i). Instead of repeating similar arguments, the analysis references the appropriate parts of Section (b)(i) when appropriate and focuses on the marginal differences that arise with the proposed order-to-trade maximum ratio measure.

- Benefits

- (i) **Increase the likelihood of a viewed quote being available to trade.** See Section (2)(i) (Benefits) (i). This benefit may be reduced in Option 3 relative to Option 2 as there is no certainty that a quote will exist for a certain length of time. Given that the quote-to-trade ratio will be an average over some time window it could be that some quotes exist for a very short time while others last substantially longer. The certainty that accompanies Option 2 is reduced.
- (ii) **Align quoting activity with its costs.** While the minimum quote life would likely reduce quote activity, the maximum quote-to-trade proposed measure would make market participants partially internalize the costs exchanges incur in processing quotes.

Trading venues invest heavily in high performance computing systems in order to process messages quickly. They usually carry large amounts of excess capacity as message activity can peak at several times the rate of normal traffic flow.

A small cost is incurred by exchanges for each quote message – it requires a minute amount of energy and computing power to process. Many exchanges do not charge market participants for sending messages. This causes a misalignment of incentives. A quote-to-trade maximum requires market participants to internalize some of the message activity cost.

The potential cost of more messages increases when message traffic is heaviest, which likely will make market participants alter their quoting behavior and reduce quote revisions and cancellations if they are required to internalize the message costs. As a result, trading venues should experience a lower degree of message volatility and would be able to reduce their excess capacity as the maximum rate of message traffic would decline.

In addition to the cost exchanges incur from processing high quote traffic, other market participants that follow intraday market activities must invest more in their computing systems as the level of traffic increases. This negative externality produced by those generating the highest quote traffic will be reduced with the quote-to-trade proposed rule.

- (iii) Reduce hyper-active order book participation. See Section (2)(i) (Benefits) (iii).

- Costs

- (i) **Monitoring and enforcement.** See Section (2)(i) (Costs) (i). The monitoring and enforcement costs of Option 3 are likely greater than those for Option 2. The way in which messages enter trading venues does not lend itself to easily identifying the true end user, determining what market participants are doing on other exchanges, and other technical details.
- (ii) **Reduce depth.** See Section (2)(i) (Costs) (ii). Whereas the minimum time constraint would apply to every quote, the order-to-trade ratio allows for greater flexibility. Given that much of the time the order-to-trade ratio will be a non-binding constraint, the depth and bid-ask competitiveness will not be affected. However, when a market participant does near the maximum quote-to-trade ratio they will likely be more cautious about placing quotes given they will be penalized if they withdraw too many quotes. This hesitance is most likely to occur in volatile times, as discussed below in Section (3)(i) (Costs) (iv).
- (iii) **Increase bid-ask spreads.** See Section (2)(i) (Costs) (iii) and Section (3)(i) (Costs) (iii).
- (iv) **Exacerbate liquidity withdrawal in volatile times.** The argument is similar to Section (2)(i) (Costs) (iv) except that the impetus for reduced liquidity provision is that the market participant is more likely to abut the quote-to-trade maximum boundary during extreme market events and, subsequently, be more cautious of the quotes she provides to the market.

Option 4 is to implement both (2) and (3). The costs and benefits of this proposal are summarized in the cost-benefit analysis of Option 2 and Option 3. Depending on the time horizon of the minimum quote life, Option 2 may make Option 3 irrelevant. If quotes are required to rest on the order book long enough, then the requirement of staying under a set order-to-trade ratio may be non-binding.

## 7. Future

How might these costs, risks, and benefits evolve in the next ten years? Such speculation is always difficult. Ten years in the past, very few experts would have predicted the extent to which trading has been automated. Few likely expected the explosive growth in limit order book cancellations and revisions that has occurred. Nor was it foreseen that some firms would compete on entering trades in millisecond time horizons.

Without a change in regulation, it is likely that there will be more limit orders per trade executed and that the limit order quote life will continue to decrease. This would simply be a continuation of what has been occurring in financial markets over the last five years. With the proposed measures there would be a regulatory bound to the quotes per trade ratio or the minimum quote life.

In the last few years there has been a move towards fragmented trading in financial markets. While the costs and benefits of this market structure change are beyond the scope of this regulatory impact assessment, the move towards having multiple trading venues will likely have a meaningful impact on the future of trading. Regarding the proposed measures, already some markets have restrictions on placing and cancelling orders. When there are competing market venues with different rules, such as whether to have a minimum quote life or a maximum ratio of quotes per trade, investors will be able to choose for themselves the market they believe provides the best trade execution and service. With multiple venues to choose from trading over the next ten years would gravitate towards market structures that best suit investors.

### **8. Summary and recommendation**

Financial markets and market participants evolve over time and regulation needs to do the same. One recent change in markets is the growth in trading volume and the even greater growth in quoting activity. A variety of potential risks have arisen with the new activity. These include a loss of confidence in interacting with financial markets at human speeds, displayed liquidity not accurately representing true liquidity, heightened adverse execution costs, excessive quote changing, and game-playing in the order book.

MiFID proposes two measures to respond to the new market behavior. The first would require a minimum time in which quotes have to exist on the order book. The second would mandate a maximum quote-to-trade ratio. Both are attempts to slow quoting activity and address the above-mentioned risks. Both proposed measures are feasible to implement but would require clarification in their technical applications. Of the two proposals the quote-to-trade maximum ratio may be more technically challenging to implement.

This regulatory impact assessment report analyzes the costs and benefits of the different options. No option displays a clear positive cost-benefit result for financial markets and its participants. There are very real costs associated with both options that could outweigh the benefits. Overall, introducing a maximum quote-to-trade ratio would likely be a smaller change to the market structure rules than introducing a minimum quote life.

Which proposed order book activity restriction option is optimal is an empirical question. The desired level of regulation may be to leave the order book activity untouched or it may be to implement both proposed measures. It is the author's belief that not enough is currently known to determine whether the benefits will outweigh the costs. As such, more empirical data on the topic needs to be collected and analyzed. In addition, other alternative ways to improve liquidity, increase market stability, and direct the trading technology spending towards the socially optimal level should be considered. Three such possibilities include the use of small cancellation fees, lower liquidity provider rebates for orders that can be cancelled within a certain time window, or a liquidity maker-taker fee structure that varies with market conditions.



