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 Foresight

# **Tick size regulation: costs, benefits and risks**

**Economic Impact Assessment EIA7**

Foresight, Government Office for Science

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# Tick size regulation: costs, benefits, and risks

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## I. Objective

The tick size, or minimum price variation, is the smallest increment permitted in quoting or trading a security. For example, one may trade BP on the LSE at 500 or 500.05 pence, but not at 500.0001. Tick rules protect investors who have displayed their trading interest to the market by making other investors pay an economically significant amount more to trade ahead of them. Tick rules have an important impact on the trading costs paid by investors as well as on overall market quality.

Exchanges have long set their own rules, with little need for regulatory supervision. However, in the newly competitive world of share trading, there is a risk of a “race to the bottom” in which competing trading platforms attempt to gain market share by providing venues for traders to trade in ever smaller increments. This would force all trading platforms to adopt the lower trading increments, resulting in an overall reduction in investor protection and a degradation of market quality. One possible regulatory approach would be to set an EU-wide minimum tick rule.

The objective of this review is to explore the desirability of a prescribed minimum tick rule. The objective of such a rule would be to prevent such a race to the bottom and provide for a more stable and liquid capital market with low trading costs. This analysis recommends that regulators require industry participants to participate in and adhere to industry standard specifications such as those that the Federation of European Securities Exchanges (FESE) has developed.

## 2. Background

The European Commission, in a recent public consultation, asked “Is it necessary that minimum tick sizes are prescribed?”<sup>1</sup> This paper provides a regulatory impact assessment of the costs, benefits, and risks of regulation regarding tick size.

### 2.1. Introduction

The tick size is the minimum permitted price variation in a security price. Trading venues around the world all have rules that set a minimum price variation. For example, on the NYSE the minimum price variation for all stocks over \$1 is \$.01. This means that the NYSE will accept orders to trade at \$10.00 or \$10.01, but it will not accept an order priced at \$10.001.<sup>2</sup>

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<sup>1</sup> See *Review Of The Markets In Financial Instruments Directive (MIFID)*, page 17, [http://ec.europa.eu/internal\\_market/consultations/docs/2010/mifid/consultation\\_paper\\_en.pdf](http://ec.europa.eu/internal_market/consultations/docs/2010/mifid/consultation_paper_en.pdf)

<sup>2</sup> However, in the U.S. market executions can occur at subpenny prices as various dark pools and dealers sometimes provide price improvement. For example, the crossing of trades at the midpoint of the bid-ask spread sometimes results in subpenny executions. Trades where the prices are based on a formula, such as Volume Weighted Average Price (VWAP) trades, may also result in subpenny executions. However, under SEC Rule 612 brokers are not allowed to accept or rank orders with increments smaller than one penny. The NYSE has proposed to permit some trading at intervals of \$.001, but this proposal is still pending as of this writing at the SEC.

European exchanges have generally adopted tick size regimes in which the tick size varies with the share price.<sup>3</sup> For example, Deutsche Boerse has adopted the following ticks for shares in its Xetra system:

Lower Price Limit (€)	Upper Price Limit (€)	Tick Size(€)
0	9.999	.001
10	49.995	.005
50	99.99	.01
100	∞	.05

The Tokyo Stock Exchange has a similar tick size regime:

Lower Price Limit (¥)	Upper Price Limit (¥)	Tick Size (¥)
0	3,000	1
3,005	5,000	5
5,010	30,000	10
30,050	50,000	50
50,100	300,000	100
300,500	500,000	500
501,000	3,000,000	1,000
3,005,000	5,000,000	5,000
5,010,000	30,000,000	10,000
30,050,000	50,000,000	50,000
50,100,000	∞	100,000

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<sup>3</sup> See [http://www.fese.be/lib/files/Implementation\\_Dates\\_and\\_Chosen\\_Models\\_12APR10.pdf](http://www.fese.be/lib/files/Implementation_Dates_and_Chosen_Models_12APR10.pdf) for a description of the harmonisation of tick regimes in Europe.

The London Stock Exchange has a more sophisticated regime in which tick sizes vary not only by price but also by the type of stock as well. The appendix contains more details.<sup>4</sup>

Tick rules have many benefits:

1. Protection for time priority of limit orders.<sup>5</sup> In a limit order book market, a trader can go to the front of the queue by placing an order at a price better than an existing order. For example, suppose that an investor places a limit order to purchase a stock at 10.00 and the order is displayed in the limit order book. The investor has exposed his trading interest to the world, and thus revealed the information that he or she is willing to trade. Furthermore, by placing a standing limit order to buy at 10, the investor has given away a free put option to the market, albeit one of very low duration.<sup>6</sup> If another investor arrives who also wants to buy at 10, then the new investor's order would have a lower priority. When a market sell order comes in, the first investor's order at that price gets filled first. However, if the later investor were allowed to bid 10.00000001, then the higher price would put that second investor at the front of the queue, even though there is an infinitesimal difference in price. By instituting a minimum tick, the trading venue forces investors who want to go to the front of the queue to increase their bids by an economically meaningful amount for the privilege.

Here is an example of a parasitic trading strategy facilitated by a tick size that is too small. A large institution displays an order to purchase a large block at 10.00. An opportunistic trader observes the order and infers that the institution must know something and the price will go up. The trader then places an order to buy at \$10.0000001 which gets executed. If the inference is correct, the stock goes up and the trader makes a profit. If not, the trader can always reverse course and sell to the institution's standing limit order at 10.00, having lost very little in the process. Obviously, this strategy disadvantages the institution that displayed its order to the world, and it will take steps to reduce such information leakage by posting smaller quantities or resorting to dark pools.<sup>7</sup>

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<sup>4</sup> See <http://www.londonstockexchange.com/products-and-services/trading-services/millennium-exchange-business-parameters.xls> for details on the price formats used on the LSE.

<sup>5</sup> A *limit order* is an order to trade that specifies a specific price. For example, an investor may place an order to purchase 1,000 shares of BP at £5.00. This means that the investor is not willing to pay more than £5.00 and the order cannot be executed at a higher price, but it can be executed at a lower price. In contrast, a *market order* to buy instructs the broker to buy the shares at the best price currently available, without any specific price limit. *Time priority* refers to the tie-breaking practice commonly used in most exchanges. When two orders specify the same limit price, the one that was entered first is usually executed first. Exchanges generally refer to the set of active limit orders available for execution as the *limit order book*, a reference to the old days when such orders were literally written in a book that looked like a ledger book.

<sup>6</sup> A put option gives the holder of the option the right to sell the underlying asset at a fixed price. Options are always worth at least zero, and are sometimes quite valuable depending on the fixed exercise price, time to expiration, and volatility of the underlying asset.

<sup>7</sup> A dark pool is a trading platform that does not widely disseminate its quotations. This permits institutions to enter large orders without the fear that merely entering an order will cause the price to run away from it.

It is important to protect the investors who place standing public orders in limit order books, because these orders provide depth and liquidity to the market. Such orders make it possible for investors to trade quickly in the sizes they desire at reasonable prices. Investors are more willing to use limit orders as the tick size relative to the stock price increases. Without the liquidity provided by standing limit orders, markets would be much more volatile and investors would face much higher transactions costs. Increasing transactions costs in the market would increase the cost of capital for issuers, resulting in less investment and less economic growth.

2. *Provides a floor on the bid-ask spread.*<sup>8</sup> This is both an advantage and a disadvantage. The tick size sets the minimum difference, or “spread” between the bid and offer (or ask) prices. Since the bid-ask spread is one of the costs of trading, a smaller tick size, *ceteris paribus*, reduces bid-ask spreads in situation where the tick size itself is binding. However, the bid-ask spread is an important part of revenue for investors following market making strategies. Thus, a tick that is too small may discourage market participants from acting as market makers and posting liquidity in the market. On the other hand, the bid-ask spread is also a transaction cost that is paid by the end users of the markets.
3. *Simplified trading environment.* Although computers process most trading, humans are still involved in the placing of orders and the monitoring of market activity. Numbers with more decimals are harder to keep track of than numbers with fewer decimals. A smaller number of possible prices makes it easier for the users of markets to comprehend what is going on. Less real estate is used up on trading screens that display price information. Fewer price points mean that it takes less screen space to display a limit order book. A simpler and more understandable trading environment implies that humans will make fewer costly mistakes while trading. Even though most orders are automatically generated and executed, there is still substantial human participation in markets.
4. *Reduced bandwidth needs.* Even in a computerized environment, a tick rule can produce costs savings by reducing the bandwidth needed for trading. For example, a change in the cash market price of a single instrument can lead to a price update for literally hundreds of related options and other derivative products. Reducing the number of possible price changes economizes the bandwidth needed by the exchanges, data vendors, and other industry participants. Furthermore, a tick rule can reduce the number of bytes needed to store price information, resulting in savings in the cost of bandwidth and data storage.
5. *Reduced time in negotiation.* In a manual negotiation environment, such as the upstairs market for block trades, limiting the number of potential outcomes reduces the time needed to negotiate a trade. By adopting rules that limit the number of outcomes, a market thus reduces transactions costs by reducing the time spent in negotiations. This feature is less important in today’s highly automated markets.
6. *Higher likelihood of a match.* However, even in electronic markets, concentrating orders onto fewer price points may also increase the likelihood of matching orders quickly. For example, suppose a buyer would place a limit order to buy at 15.09 and a seller would place a limit

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<sup>8</sup> The *bid-ask spread* is the difference between the best bid and best offer prices. The best bid price is the highest price at which there is an existing order to buy. A market sell order would generally be executed at the best bid price. The best offer price is the lowest price at which there is an existing order to sell. A market buy order would generally be executed at the best offer price. The bid-ask spread, or commonly called just “the spread” represents the round-trip transactions cost (without commissions) for an investor who purchased and then immediately sold shares.

order to sell at 15.11. If limit prices were allowed at those levels, then no trade would take place. However, if the tick size were .05, those price points would not be allowed. Suppose then that the traders were willing to round their orders to the nearest price point.<sup>9</sup> The buyer bids 15.10 to buy and the seller offers to sell at 15.10, and a trade takes place.

## 2.2. Optimal tick size

The optimal tick size thus represents a tradeoff. A wider tick provides more incentives for investors to place limit orders, thus boosting the liquidity displayed in a limit order book. A wider tick likewise results in a higher minimum bid-ask spread, increasing the profitability of market making and motivating more firms to engage in market making activities, also increasing liquidity. However, higher minimum bid-ask spreads increase transactions costs for investors, thus inhibiting trading and reducing liquidity. The optimal tick size is a tradeoff between these two opposing forces.

The optimal tick size is not necessarily the same for all firms. Smaller firms may benefit from having a wider relative tick than larger firms, as the benefits of increased liquidity from limit orders and market makers outweigh the cost of higher minimum bid-ask spreads. Larger firms, on the other hand, may already be so naturally liquid that the benefits of a smaller bid-ask spread outweigh the incentives that a larger tick provides for liquidity providers. Likewise, less actively traded firms may also benefit from a wider tick size that will incentivize more investors to display orders in the public market.

Indeed, the optimal tick size is not necessarily the same under different market structures. In dealer markets, dealers incur costs of inventory holding, adverse selection costs, and order processing costs. The tick size sets the minimum spread and thus affects the profitability and attractiveness of market making. A wider tick increases dealer profitability and thus motivates more dealers to provide liquidity. The cost structure of market participants may be very different in a pure limit order market where end investors interact directly without intermediaries. A lower tick might be optimal in such a market. Today's markets are hybrids of dealer and auction markets, in which market makers post orders in the public limit order books on the same terms as end investors.

## 2.3. Stock splits and tick size

It should be noted that although the tick size is set by the trading platforms, the relative tick size (the tick size as a percentage of the stock price) is also affected by the issuers. By splitting or reverse splitting the stock, the issuer can change the relative tick size depending on the tick rules affecting the stock. This is easier to do in a regime where there are relatively few price bands that lead to changes in tick size, such as in the United States. Since issuers have an incentive for the secondary markets of their stocks to have the highest quality, issuers may choose to split their stock to move the stock price to the region of maximum market quality. To be sure, there are factors other than relative tick size that can also affect issuers' decisions regarding stock splits, such as investor perceptions of stocks with prices significantly higher or lower than typical shares.

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<sup>9</sup> This may or may not be the case, depending the trading objectives of the investors. If the investors in this example instead round buy orders down and sell orders up, then the rounded orders would still not match and no trade would take place.



## 2.4. Academic literature

There is quite an extensive academic literature on the issue of tick sizes. The appendix contains a bibliography of many of the papers. Harris (1991, 1994) is a good place to start. There have been many empirical papers that examine the impact of the various tick size changes that have occurred in many of the markets, such as Bacidore (1997). In general, these papers have found that when tick sizes were reduced, bid-ask spreads fell, but so did quoted sizes. Thus, transactions costs for smaller retail investors, who trade small sizes at the quoted spreads, unambiguously enjoyed lower transactions costs. This should not be too surprising, given the role of the tick size in setting a lower bound on the bid-ask spread. Indeed, that various measures of market quality increase after a change in tick sizes also should not be surprising, because such changes are not random events. Exchanges generally are only going to change the tick size when they feel it is in their best interest to do so, and an improvement in market quality will generally result in more trading volume and hence revenue for the exchange. Likewise, an empirical finding that a reduction in tick size led to an improvement in market quality does not imply that reducing tick size still further will result in an even greater improvement, as there is likely an optimal tick size and it is possible to set the actual tick too low as well as too high.

However, the reductions in tick sizes produce ambiguous results for institutional investors who trade in sizes far larger than available at the inside spread. For them, the reduction in displayed depth can have serious adverse consequences. Jones and Lipson (2001) document that institutional trading costs actually increased after a 1997 reduction in the US tick size, as does Goldstein (2000).

Angel (1997) provides a mathematical model of the optimal tick size that represents a tradeoff between the liquidity enhancing benefits of a wider tick and the transactions costs of a wider tick, as well as a discussion of the impact of tick size on stock splits.

## 2.5. Reason for government action

There are two primary reasons why it might be beneficial to have government regulation of tick sizes.

1. *Prevent collusion.* Exchanges may have a financial incentive to set the tick size at a level that maximizes profits to their members and not overall social benefits. In particular, an exchange that is controlled by dealers might set the tick size at a high level to keep the bid-ask spread high and thus maximize dealer profits. Indeed, the old NYSE was a membership organization, and the tick size was set at one eighth of a dollar, \$.125. It took the threat of legislation and strong pressure from the SEC to reduce the tick size to one cent. Bid-ask spreads dropped dramatically after the reduction, but so did displayed depth at the quotes. The old dealer-driven NASDAQ market also experienced a scandal in the 1990s when dealers colluded to keep bid-ask spreads artificially wide.<sup>10</sup>

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<sup>10</sup> For details, see the official government report, "Report Pursuant to Section 21(a) of the Securities Exchange Act of 1934 Regarding the NASD and the NASDAQ Market," at <http://www.sec.gov/litigation/investreport/nasdaq21a.htm>

Now that exchanges are shareholder owned, the pressure to keep tick sizes artificially high is reduced. The exchanges now have an incentive to maximize profits by maximizing trading volume. As an artificially high tick would depress trading volume, it would not be in an exchange's best interest to maintain such a high tick size.

2. *Prevent a race to the bottom.* In a competitive exchange environment, a new trading platform may compete by offering a smaller tick size than the existing exchanges. This would allow traders to bypass the queue at the other markets by placing limit orders with limit prices just a tiny bit better than existing limit orders already displayed in the market. Brokers attempting to get best execution for their clients would have send their orders to the market with the best price, even if that best price was only infinitesimally better than in other exchanges. This competition forces exchanges to match each other on tick size, resulting in a race to the bottom. The result is a tick regime with ticks that are too small. Although the minimum bid-ask spread would be small, the poor incentives for limit orders and market making means that investors will experience high market impact on large trades and potentially higher volatility.

There is a precedent for governmental regulation of tick size. In 2000, the US SEC ordered US exchanges to change tick sizes in the process of decimalization.<sup>11</sup> The U.S. Securities and Exchange Commission (SEC) now regulates tick sizes under its Rule 612, which specifies a minimum tick size of \$.01 for stocks trading above \$1.00, although exchanges could have rules specifying larger tick sizes if they wanted.<sup>12</sup>

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<sup>11</sup> <http://www.sec.gov/divisions/marketreg/34-42360.htm>. This followed years of political pressure, including proposed but never passed legislation in the US Congress (SB838 and HR1053 in 1997) that would have mandated such a change. This was resisted by the NYSE, whose specialists benefited from a wide tick. The US markets moved from a \$1/8 tick to a \$1/16<sup>th</sup> tick in 1997, but waited until 2001 to convert to decimals with a \$.01 tick.

<sup>12</sup> Specifically, SEC Rule 612, passed in 2005 as part of Regulation NMS, reads as follows:

Rule 612 Minimum Pricing Increment

- a. No national securities exchange, national securities association, alternative trading system, vendor, or broker or dealer shall display, rank, or accept from any person a bid or offer, an order, or an indication of interest in any NMS stock priced in an increment smaller than \$0.01 if that bid or offer, order, or indication of interest is priced equal to or greater than \$1.00 per share.
- b. No national securities exchange, national securities association, alternative trading system, vendor, or broker or dealer shall display, rank, or accept from any person a bid or offer, an order, or an indication of interest in any NMS stock priced in an increment smaller than \$0.0001 if that bid or offer, order, or indication of interest is priced less than \$1.00 per share.
- c. The Commission, by order, may exempt from the provisions of this section, either unconditionally or on specified terms and conditions, any person, security, quotation, or order, or any class or classes of persons, securities, quotations, or orders, if the Commission determines that such exemption is necessary or appropriate in the public interest, and is consistent with the protection of investors.

See <http://www.sec.gov/divisions/marketreg/subpenny612faq.htm> for more information on Rule 612

### 3. Risk assessment

If no action is taken, there is a risk that there could be a race to the bottom as new entrants such as dark pools or newer multilateral trading facilities (MTFs) attempt to compete by providing smaller pricing increments. This would force existing players to match the smaller increments, leading to tick sizes below the level needed for best market quality.

The Federation of European Securities Exchanges (FESE) has led efforts to harmonise tick sizes in the European markets. They report that there were over 25 different tick regimes in effect at the start of their project.<sup>13</sup> They now report that there are three different tick regimes in general use.<sup>14</sup> However, there is no guarantee that new entrants will adhere to these harmonised tick sizes.

How serious is this risk? The NYSE has already proposed to reduce its tick size to \$.001 for orders placed into its new Retail Liquidity Program.<sup>15</sup> The NYSE has done this in part to compete with internalizers and dark pools that sometimes execute trades at subpenny prices despite the restrictions in Rule 612.<sup>16</sup> Given that it is happening in the US, it could happen in Europe.

### 4. Options

In order to assess the costs, benefits, and risks of proposed any rulemaking regarding tick size, it is important to determine exactly what such rules would entail. As there are many different ways such rules could be structured, it is important to examine each of the possible regulatory responses.

There are many possible regulatory approaches to issues regarding tick rules.

1. *Do nothing, but monitor situation.* The Federation of European Securities Exchanges (FESE) has coordinated a dialogue among European market participants that has resulted in general agreement to harmonise tick size regimes throughout the EU.<sup>17</sup> As many exchanges have modified their tick rules in accordance with the FESE dialogue, none of the potential

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<sup>13</sup> See FESE “Tick Size Regimes” <http://www.fese.be/en/?inc=cat&id=34>

<sup>14</sup> [http://www.fese.be/lib/files/UPDATED\\_FESE\\_TICK\\_SIZE\\_TABLES\\_AS\\_OF\\_SEPT\\_2011.pdf](http://www.fese.be/lib/files/UPDATED_FESE_TICK_SIZE_TABLES_AS_OF_SEPT_2011.pdf)

<sup>15</sup> See <http://www.sec.gov/rules/sro/nyse/2011/34-65672.pdf>.

<sup>16</sup> Although SEC Rule 612 prohibits brokers and trading systems from accepting orders in subpennies, it does not prohibit the execution of trades in subpennies. Thus, an internalizing dealer can trade with a client at 9.9999 and claim that it is offering “price improvement” over an offer of \$10.00 that the client would have gotten from an exchange. Internalization refers to the practice of a broker taking the other side of a customer trade rather than sending the order to an exchange, generally in the hope of earning the bid ask spread by later trading with another customer in the opposite direction.

<sup>17</sup> FESE Tick Size Regimes, *ibid.*

problems stemming from an unregulated tick size may occur. A policy of “watchful waiting” would monitor market developments. A race to the bottom in tick size would be a plainly evident event that could be dealt with if and when it occurs.

2. *Make adherence with industry standard protocols mandatory for new entrants.* There are numerous industry technical standards, such as the FIX protocol, and it goes almost without saying that new participants will adhere to these standards. Regulators have significant informal power to affect the operation of new trading facilities before they are approved, and to impact their trading afterwards. Regulators could make it clear that all industry participants, and especially new entrants, would be expected to conform to standard industry operating procedures, including the FESE standard tick sizes. This would prevent the race to the bottom, give the industry flexibility to set tick sizes, and relieve regulators of the job of actually setting the specific parameters. This could be done informally without the overhead of a formal rulemaking process.
3. *Establish a set of uniform tick rules similar to existing industry practices.* This approach would provide no disruption to existing processes, while still providing regulatory force to maintain industry practices and prevent a race to the bottom. It would, however, have the side effect of effectively freezing the tick rules in their current form, which will make future changes more difficult to make when future conditions change.
4. *Establish tick rules requiring significant changes.* It is conceivable that a regulator may wish to impose tick rules that are different from existing industry practices. For example, rules could specify that tick rules be based on criteria other than just the stock price. For example, a rule could specify that the tick size be based not only on share price, but also on the size of the company. Tick sizes could be set by the issuers, not exchanges. Tick sizes could also be dynamic, and change intraday according to market conditions. Any such major changes should be thoroughly tested in scientifically designed controlled pilot experiments that would generate good quality data sufficient to enlighten the rulemaking process.

### 4.1. Recommendation

The second alternative, an informal requirement that industry participants adhere to industry protocols such as the FESE tick size tables, is the most reasonable at this time. This achieves the regulatory objective of preventing a race to the bottom in tick sizes, while requiring minimal regulatory resources to implement. Furthermore, it leaves the technical details of designing the optimal tick regime to market participants, who have the proper incentives to set a tick regime that maximizes market quality.

## 5. Costs, risks, and benefits

### 5.1. Costs

#### ***Alternative 1: Doing nothing, but monitor situation.***

There would be no implementation costs. Regulators would expend some minor resources to monitor the situation.

#### ***Alternative 2: Make adherence with industry standard protocols mandatory for new entrants.***

There would be no implementation costs. Regulators would expend some minor resources to monitor the situation and sometimes pressure industry participants to adhere to industry standards.

**Alternative 3: Establish a set of uniform tick rules similar to existing industry practices.**

As all trading platforms already have some kind of tick size built into their systems, the implementation cost of rules that are similar to existing industry practices would be trivial for most firms. There would, however, be the normal costs involved in a formal rulemaking, along with continuing monitoring costs by the regulators to ensure compliance with the rules. Regulators would have to monitor trading to see if there were any trading in violation of the tick rules. Alternatively, the regulators could sit back and wait for complaints. As any pattern of persistent violations would be plainly visible in the industry, it is likely that competitors would rapidly bring any violations to the attention of the regulators.

**Alternative 4: Establish tick rules requiring significant changes**

Establishing tick rules substantially different from existing industry practices would result in costs to market participants to re-engineer their processes to comply. Market participants would have to re-program their systems, which could entail substantial information technology expenses. This would be especially the case if the tick rules were made more dynamic based on market conditions, which could lead to ever changing tick sizes. This would require enhancing the systems to constantly monitor the market to update the tick size when needed.

As such major changes should be tested with scientifically designed controlled experiments, there would be additional costs to design the experiments, as well as systems changes needed in the industry to change tick sizes with the ability to have different ticks for different stocks with similar prices.

## 5.2. Benefits

The benefits of tick size regulation are hard to quantify. An optimal tick regime would optimize liquidity for stocks. Liquidity is a concept that is hard to measure. When practitioners speak of liquidity, they generally mean the ability to trade large quantities quickly without moving the price. Liquidity thus encompasses multiple dimensions including time to execution, market impact, and other transactions costs. These are hard to measure, and harder still to gather into one number to measure liquidity. Even though liquidity is hard to measure, it is quite valuable.<sup>18</sup>

In an optimal tick size regime, investors would experience the lowest transactions costs consistent with optimal liquidity. Contrary to popular opinion, however, the optimal level of transactions costs is usually not zero. Although investors clearly prefer to pay less than more, transactions costs for trades represent the wages paid to intermediaries who provide valuable services that include not only matching buyer and seller, but also producing valuable information in the process. To assert that the price of these services should be zero is as incorrect as asserting that the price of any other valuable service should be zero.

If regulatory action prevents a destructive race to the bottom, then it could have significant, although hard to quantify, benefits.

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<sup>18</sup> Numerous papers in the valuation literature document the value of liquidity. For one example, see Lawrence Benveniste, Dennis R. Capozza, and Paul J. Seguin, 2001, The Value of Liquidity, *Real Estate Economics* 29, 633-660.

### 5.3.Risks

There are risks involved in the direct regulation of tick sizes (alternatives three and four):

1. Scarce regulatory resources may be diverted from other more worthwhile activities.
2. The regulators may decree non-optimal tick sizes. Given that regulators often lack sufficient resources and analytic capacity, there is a risk that the regulators will settle on a tick regime that is not the best. Indeed, it will be hard for regulators to correctly choose the optimal tick size. Thus, liquidity may be reduced and/or transactions costs may be higher than the need to be.
3. If the tick size for small companies is too small, a lack of liquidity for smaller stocks could inhibit the founding of new companies and thus inhibit economic growth.
4. Even if the tick size regime is optimal at first, it may lack the flexibility to change as the markets evolve. A private sector solution may have more flexibility.
5. Compliance costs may be higher than expected, both for the regulated markets as well as the regulators.
6. The rules may provide incentives to trade outside the EU. If other jurisdictions permit trading in smaller increments, trading may move over there.
7. A regulated tick size may stifle innovation. An exchange may want to launch a new trading platform that chooses tick size in a way different from the regulations. For example, one market might want to let issuers pick the tick size. This may not be possible with a set of one-size-fits-all tick size regulations.

There are also risks in the preferred alternative, require adherence to industry standard protocols.

1. Although FESE has worked hard to harmonise tick rules, the harmonisation is not yet complete. Industry participants may not be able to agree on harmonisation, and the process may become so politicized that a stalemate occurs.
2. Not all market participants have the incentive to maximize market quality. The exchanges have incentives to maximize trading volume, which is driven by overall market quality. However, internalizers such as market makers may prefer higher tick sizes in order to benefit from wider bid-ask spreads. Fortunately FESE appears to be dominated by exchanges, but there is the possibility that large internalizers may wield enough influence to result in larger than optimal tick standards.

## 6. Future

Market structure will continue to evolve over the coming years. In the old regime, exchanges were *de facto* public utility monopolies operated on a not-for-profit basis for their members. Exchange policies were designed for the benefits of members. As many members engaged in market making, tick rules favored market makers.

Demutualization and technology have led to a market structure revolution. Exchanges are now for-profit shareholder-driven enterprises, and their policies are designed to maximize the profits of the exchange, not the dealers. This generally means policies that maximize trading volume. However, regulators around the world have generally adopted pro-competition policies to contain anti-competitive practices by the exchanges. Regulators have made it much easier for new entrants to compete with existing players. In general, this has increased market quality on



most traditional measures of market quality.<sup>19</sup> As a result, exchanges face serious competition from other exchanges, from internalization, and from new trading platforms.

This competition will occur on a number of fronts, including price, pricing models, speed, transparency, and trading technology. On the whole, this competition is a good thing and will result in market networks that are generally better than the existing markets. Regulators should encourage a market structure that allows easy entry and easy exit with stocks easily traded on a number of different competing platforms. This will allow exchanges to cater to various clienteles, whether institutional or retail. Notice that the market is the network of all participants in a particular financial product, and not just a single exchange, which is just a node in the complex network. Of course, these markets will also be different, and may experience unexpected properties and may fail in different ways, as we saw in the US “flash crash” of May 6, 2010. However, just because the markets will have some different risks does not necessarily mean that the changes will be bad, just that the risks need to be managed properly.

However, this competition could also occur in the dimension of tick size, which would lead to a race to the bottom resulting in suboptimal market quality. As this is already starting to happen in the United States, it is likely that it will happen in the European Union as well.

## 7. Summary and recommendation

Exchanges around the world set tick rules as a way to simplify trading and promote liquidity provision. A tick rule protects investors who display their willingness to trade in the public markets. The optimal tick size represents a tradeoff: a wider tick promotes liquidity from market makers and limit order traders, but at the cost of a higher minimum bid-ask spread.

The Federation of European Stock Exchanges (FESE) has worked hard to harmonise tick rules at member exchanges. However, increasing competition in European markets raises the likelihood that new entrants will adopt smaller tick sizes to gain market share, sparking a race to the bottom as other market participants match the new tick sizes to protect their markets. In the US, the NYSE has already proposed a smaller tick in its Retail Liquidity Provider program as a reaction to competition from internalizers and dark pools.

The recommended regulatory response is to require all market participants, and especially internalizers, dark pools, and new participants, to adhere to industry standard protocols such as the FESE tick rules. This can be done as a widely understood but yet informal expectation by the regulators. Firms not in compliance could expect pressure in various forms from the regulators to comply. If that is not effective, it could also be implemented as a formal rulemaking. Industry participants for the most part have the proper incentives to set tick rules at the level that maximizes market quality and thus social welfare.

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<sup>19</sup> See Angel, Harris, and Spatt, 2011, “Equity Trading in the 21<sup>st</sup> Century”, *Quarterly Journal of Finance* 1:1-53, for documentation of these increases in market quality.

## Appendix I: A bibliography of the tick size literature

This Appendix contains a bibliography of academic literature examining issues related to tick size.

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## Appendix 2: Tick regimes in various markets

### London Stock Exchange:

Dynamic Price Format schedule for FTSE 100 Index securities on granular tick regime				
<b>SET0</b>				
Range	Price Form at Code	Price Format Description		Price Format Value
Less than 0.9999	Z	One ten-thousandth		0.0001
1 – 4.9995	Y	One two-thousandth		0.0005
5 – 9.999	M	One thousandth		0.001
10 – 49.995	K	One two-hundredth		0.005
50 – 99.99	J	One hundredth		0.01
100 – 499.95	V	One twentieth		0.05
500 – 999.9	X	One tenth		0.1
1000 – 4999.5	H	Halves		0.5
5000 – 9999	W	Whole		1

Dynamic Price Format schedule for FTSE 100 Index securities on granular tick regime				
10000 or more	P	Five		5

**Dynamic Price Format schedule for FTSE 100 Index securities on non-granular tick regime and all FTSE 250 Index securities**

<b>SET1, STMM</b>				
<b>Range</b>	<b>Price Format Code</b>	<b>Price Format Description</b>		<b>Price Format Value</b>
<b>GBX / GBP / USD / EUR</b>				
Less than 0.5	Z	One ten-thousandth		0.0001
0.5 – 0.9995	Y	One two-thousandth		0.0005
1 – 4.999	M	One thousandth		0.001
5 – 9.995	K	One two-hundredth		0.005
10 – 49.99	J	One hundredth		0.01
50 – 99.95	V	One twentieth		0.05
100 – 499.9	X	One tenth		0.1
500 – 999.5	H	Halves		0.5
1000 – 4999	W	Whole		1
5000 – 9995	P	Five		5
10000 or more	C	Ten		10

Source: <http://www.londonstockexchange.com/products-and-services/trading-services/millennium-exchange-business-parameters.xls>, accessed 2 February 2012.

**For the Xetra System on Deutsche Börse for shares:**

<u>Lower Price Limit</u>	<u>Upper Price Limit</u>	<u>Tick Size in EUR</u>
0 EUR	9.999 EUR	0.001 EUR
10 EUR	49.995 EUR	0.005 EUR
50 EUR	99.99 EUR	0.01 EUR
100 EUR	∞	0.05 EUR

For Exchange Traded Funds (ETFs) and Exchange Traded Commodities (ETCs)

<u>Lower Price Limit</u>	<u>Upper Price Limit</u>	<u>Tick Size</u>
0 EUR	4,999 EUR	0,001 EUR
5 EUR	9,999 EUR	0,005 EUR
10 EUR	∞	0,01 EUR

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<u>Lower Price Limit</u>	<u>Upper Price Limit</u>	<u>Tick Size</u>
0 EUR	4,999 EUR	0,001 EUR
5 EUR	∞	0,005 EUR

Instruments: 18MB, C050, C054, SXRT, DXET, DBXE, EL4B,S6X0, SC0D, EUN2,EXW1, LYSX  
-> Tick size

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Instruments: C100, DBXT, DX22, EXVM, L8I3  
-> Tick size € 0,001

[http://deutsche-boerse.com/dbag/dispatch/en/binary/gdb\\_content\\_pool/imported\\_files/public\\_files/10\\_downloads/31\\_trading\\_member/10\\_Products\\_and\\_Functionalities/20\\_Stocks/60\\_Handelsparameter/Trading\\_Prameter\\_Xetra\\_neu.pdf](http://deutsche-boerse.com/dbag/dispatch/en/binary/gdb_content_pool/imported_files/public_files/10_downloads/31_trading_member/10_Products_and_Functionalities/20_Stocks/60_Handelsparameter/Trading_Prameter_Xetra_neu.pdf)

**On Euronext cash markets:**

**c) Tick sizes:**  
*Echelons de cotation*

<b>Products</b> <i>Produits / Produkten / Produtos</i>	<b>Tick sizes</b> <i>Echelons de cotation</i>	
For equities in trading group: <i>Pour les actions / Aandelen / Acções</i>	<b>Price: 0 - 9.999</b>	<b>Tick size: 0.001</b>
	<b>Price: 10.000 - 49.995</b>	<b>Tick size: 0.005</b>
	<b>Price: 50.00 - 99.99</b>	<b>Tick size: 0.01</b>
<i>F1 - F2 - 05 - 11 - 12 - 17 - 31 - A0 - B7 - B9 - J0 - J1 - J2 - K0 - P0 - Q1</i>	<b>Price: 100.00</b>	<b>Tick size: 0.05</b>
For equities <i>Pour les actions / Aandelen / Acções</i>	€0.01	
For bonds traded in percentage <i>Pour les obligations cotées en pourcentage / Obligaties verhandelbaar in procenten / Obrigações negociadas em percentagem</i>	0.01%	
For other Securities <i>Pour les autres titres / Andere financiële instrumenten / Outros valores mobiliários</i>	€0.01	

[https://europeanequities.nyx.com/sites/europeanequities.nyx.com/files/par\\_20111219\\_08618\\_eur.pdf](https://europeanequities.nyx.com/sites/europeanequities.nyx.com/files/par_20111219_08618_eur.pdf)

**Other markets in Europe:**

[http://www.fese.be/lib/files/UPDATED\\_FESE\\_TICK\\_SIZE\\_TABLES\\_AS\\_OF\\_SEPT\\_2011.pdf](http://www.fese.be/lib/files/UPDATED_FESE_TICK_SIZE_TABLES_AS_OF_SEPT_2011.pdf)

