



# Pseudo market-makers, market quality and the minimum tick size



Andrew Lepone<sup>a,b,\*</sup>, Jin Boon Wong<sup>a,b</sup>

<sup>a</sup> Macquarie Graduate School of Management, 99 Talavera Rd, North Ryde, Sydney, NSW 2113, Australia

<sup>b</sup> Capital Markets Cooperative Research Centre, Level 3, 55 Harrington Streets, Sydney, NSW 2001, Australia

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## ABSTRACT

This paper examines how a reduction in the minimum tick size affects the behaviour of pseudo market-makers and market quality. Consistent with prior findings, this study documents that bid-ask spreads and depth decline after a minimum tick size reduction; and the magnitude of tick size reduction influence the extent of the decrease. Empirical evidence from this research indicates that pseudo market-makers prefer lower-price stocks post-reduction, as the yield from quoting these spreads are higher. This is accompanied by a corresponding shift in trading activities, away from higher priced securities. Trading costs, measured using simulated market impact, decrease for large trades in the top price tier but increase otherwise.

## 1. Introduction

The effects of changing the minimum tick size draws considerable attention from academics, industry practitioners, operators of stock exchanges and regulators worldwide as it has significant impact on market quality. In particular, the bid-ask spread (implicit cost of trading), market depth (proxy for liquidity), and market impact costs (function of both spreads and depth) are indicators of market quality which has traditionally been of the greatest interest. This paper seeks to extend the analysis beyond these measures and examine how pseudo market-makers behaviour changes after a tick reduction as they attempt to maximize profit by shifting their quoting activities to price bands that produce the largest yields.

In a seminal paper, Harris (1994) hypothesizes that a smaller tick size is likely to cause a significant reduction in the bid-ask spread, which lowers the cost of trading for investors. He proposes two possible reasons for the reduction in spreads; (i) a constraint imposed by the relatively high tick size, and (ii) the ability of investors to place limit orders at prices which were previously unavailable. The removal of the artificial ceiling which investors operated within previously allows them to quote at more optimal levels, which results in tighter spreads. Harris (1994) also proposes that quoted depth at the best prevailing level is likely to decrease as liquidity providers seek to maintain the same level of premium that they charged prior to the change. For example, investors and traders who previously placed limit orders at the best bid and ask price may now choose to place them further away from the best prices to ensure that they continue to capture a larger premium. They may choose to shift some or all orders away from the best bid and ask prices, thereby reducing the depth offered at these quotes. In addition to potentially altering the level of liquidity provided, impatient traders may now choose to use market rather than limit orders as the cost of demanding liquidity is reduced. As a result, the reduction in the minimum tick size will lead to a reduction in the depth at the best bid and ask quotes.

The reduction in tick size can also impact the quoting strategies of liquidity suppliers. Chung and Chunwongnant (2002) finds that the number of quote revisions involving changes in the spread increased dramatically after the tick size is reduced from \$1/8 to \$1/16. They argue that order submission strategies among limit order traders are restricted because the tick size creates a price limit

\* Corresponding author.

E-mail address: [andrew.lepone@mgsm.edu.au](mailto:andrew.lepone@mgsm.edu.au) (A. Lepone).

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that traders can quote. In their examination of the Tokyo Stock Exchange, [Ahn, Cai, Chan, and Hamao \(2007\)](#) document support for this finding, reporting an increase in quote-to-trade ratio after tick size reduction. [Bourghelle and Derclerck \(2004\)](#) offer a different view of limit order quoting strategies, suggesting that liquidity supply may depend on market design. In an electronic limit order book, full display of limit orders provides free trading options to quote matchers who can trade in front of large traders at very small increments. Therefore, there would be a tendency to partially hide orders and/or shift limit orders to prices further from the best quotes.

The trading behaviour of market makers affects the short-term dynamics of securities prices and available liquidity, and is of particular interest to investors, regulators and academics. Prior literature analysing the behaviour of market makers initially focused on them being competitive suppliers of liquidity, where revenues of these agents correspond to the spread (Roll, 1984; [Glosten and Harris, 1988](#); [Hasbrouck, 1988](#)). This reflects the costs they incur, such as order-handling costs (Roll, 1984), adverse-selection costs (Kyle, 1985; [Glosten and Milgrom, 1985](#); [Easley and O'Hara, 1987](#); [Glosten, 1994](#)) and inventory holding costs ([Stoll, 1978](#)). More recent literature relaxes the competitive assumption and evaluates scenarios where the supply of liquidity is provided by strategic agents bidding actively, to exploit market conditions and possibly private information, while supplying liquidity. These monopolistic markets can lead to a relative lack of liquidity ([Glosten, 1989](#); [Kyle, 1989](#); [Bernhardt and Hughson, 1997](#); [Kavajecz, 1999](#); [Dennert, 1993](#); [Biais et al., 2000](#)) and in some cases, propositions that dealers tacitly collude to set wide spreads ([Christie et al., 1994](#)).

Generally, studies examining the contribution of market makers find that they lower costs by improving liquidity and reducing bid–ask spreads ([Brooks and Su, 1997](#); [Biais et al., 2000](#)). These findings are consistent with the claims of [Foucault et al. \(2005\)](#) that the introduction of liquidity “providers” (i.e., market makers) to an order-driven market can contribute to that market's overall liquidity. Although the impact of market makers on liquidity and trading efficiency is analyzed in a number of studies, none of them examine how the trading behaviour of market makers change in response to minimum tick reductions that cause variations in the potential yields that can be captured from liquidity provision.

This paper seeks to extend the literature in three ways. First, this study examines how pseudo market-makers respond to various tick size reductions across different price bands (tiers) to capture the optimal premium from quoting. The potential migration of liquidity providers across different tiers is of particular concern to financial regulators and exchanges, as the market quality of one tier may improve significantly at the expense of another. Further, any transfer in market-making activities can have a consequential impact on trading, which is dependant not just on stock fundamentals, but also market liquidity. The first part of this research examines how the magnitude of the reduction, the potential yield from quoting (percentage return on capital), and the availability of new price intervals, affects liquidity provision (migration) across different price bands and the subsequent effect on trading activity.

The study further adopts a methodology similar to [Goldstein and Kavajecz \(2000\)](#) and simulates the available market depth across 5 min intervals for the various price bands with different tick size reductions. This provides a proxy for the estimated market impact costs of executing a range of share parcels and provides an indication of changes in transaction costs, pre- and post- the tick reduction, across different price bands. This measure, together with traditional proxies, such as bid-ask spreads and quoted depth, allows the evaluation of market quality and determines if liquidity improves (or deteriorates) across different price bands affected by the minimum tick reductions.

Finally, this research employs the methodology in [Hendershott, Jones and Menkveld \(2011\)](#) to decompose the bid-ask spreads and analyse how different components are affected by the tick reduction and its impact on market quality. In particular, the study examines effective spreads which is a superior measure of execution costs, adverse selection costs that calculates the price impact of executions by informed traders, and realized spreads which represents the revenue that market-makers get after paying for price impact.

The tiered minimum tick reduction by the Singapore Exchange (SGX) on 24 December 2007 provides an ideal experimental setting to analyse the behaviour of pseudo<sup>2</sup> market-makers and how they respond to modifications that affect the potential yields from quoting. The absence of high-frequency traders around this event provides a unique opportunity to understand how traditional non-algorithmic market-makers respond to tick size changes in a fully automated electronic limit book order. In the first phase of the tick revision,<sup>3</sup> the SGX reduced the tick size for stocks above \$10 from \$0.10 to \$0.02, for stocks between \$5 and \$9.99 from \$0.05 to \$0.01, for stocks between \$3 and \$4.99 from \$0.02 to \$0.01, while stocks below \$3 were unaffected by the change.<sup>4</sup> This provides a *natural* control group (stocks below \$3) unaffected by the minimum tick reduction, and allows the study to account for exogenous factors that may influence broad market liquidity and volatility around the event date. From these tiered reductions, the profitability from quoting a full spread for stocks above \$10, and between \$5 and \$9.99, reduced from 1% to 0.2%; for stocks between \$3 and \$4.99, profitability reduced from 0.67% to 0.33%; and for stocks below \$3, profitability was unaffected, remaining in excess of 1%.<sup>5</sup>

Theoretically, the most profitable price band from quoting competitively at the minimum tick has shifted from stocks above \$5 to securities below \$3. Hence, pseudo market-makers are likely to be drawn towards this bracket. However, it is noteworthy that the most actively traded stocks with the largest market capitalization generally trade above \$5. Prior to the tick reduction, there is a natural tendency for pseudo market-makers to concentrate their activities in stocks trading above \$5, as there is high trading interest from market participants and quoting in this price band provides the highest yield. With the tick reductions, since there is no official

<sup>2</sup> There are no official market makers in the securities market on the SGX, but discussions with exchange officials suggest that pseudo liquidity provision exists among scalpers.

<sup>3</sup> SGX subsequently embarked on another minimum tick reduction on 4 July 2011.

<sup>4</sup> The minimum tick for stocks from \$1 to \$2.99 is \$0.01 and \$0.005 for stocks below \$1.

<sup>5</sup> Potential profit is calculated as the minimum tick price divided by the lower bounds of the price bands, e.g., \$0.10/\$10.00 (pre-tick reduction), \$0.02/\$10.00 (post-tick reduction), etc.

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