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Do reductions in tick sizes influence liquidity?

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Abstract

On 4 December 1995, the Australian Stock Exchange reduced the minimum tick size for stocks priced below $A0.50 and stocks priced above $A10. We use this natural experiment to examine the impact of tick size reductions on liquidity. The present paper reports that although lower tick sizes generally lead to increased liquidity, this result is not universal. Stocks with larger relative tick sizes experience the greatest improvement in liquidity, while stocks with small relative tick sizes and low trading volume experience reduced liquidity. There is no change in order exposure as a result of the reduced tick sizes.

Key words: Bid ask spread; Liquidity; Minimum tick size

JEL Classification: G10, G14

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1. Introduction

Reductions in the minimum tick size in US markets in 1997 and again in 2001 have precipitated a large volume of academic literature examining the relationship between tick size and market liquidity. Despite the volume of research in this area, there is still no definitive answer on what constitutes an optimal tick size.

Harris (1994) was the first to examine the trade-off associated with reducing the minimum tick. He suggested that smaller minimum tick sizes may lead to significant reductions in bid ask spreads and, hence, trading costs, particularly for small liquidity demanding investors. However, he also highlighted the potential for reduced liquidity

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if investors decreased the displayed quotation sizes, engaged in frivolous negotiation or used the opportunity to free ride on the quotes of others. Therefore, although small tick sizes may lead to lower bid ask spreads, they may also make investors less willing to expose orders, leading to reduced depth. The net effect of these changes on liquidity is, therefore, an empirical question.

This trade-off between reduced spreads and depths has been explored in several empirical papers examining the impact of changes in the minimum tick size in several different markets. Goldstein and Kavajecz (2000) and Ricker (1998) reported a decline in both bid ask spreads and depth following the New York Stock Exchange's (NYSE) reduction in the minimum tick size from one-eighth to one-sixteenth of $US1. Goldstein and Kavajecz (2000) reported improvements in liquidity for small investors and reductions in liquidity for large investors. Jones and Lipson (2001) also reported increased costs for orders that aggressively demand liquidity, including large orders. Bessembinder (2003) found a decrease in spreads on both the NYSE and Nasdaq following decimalization, which resulted in the minimum tick size falling from one-sixteenth of a $US1 to $US0.01. He also found reduced quotation sizes and increased price improvement rates. He concluded that, overall, the change did not have a damaging effect on liquidity. Bacidore (1997), in an analysis of a reduction in tick sizes on the Toronto Stock Exchange (TSE) from one-eighth of $C1 to $C0.05 increments, also reported reductions in spreads and depths without any significant difference in trading volumes. He argued that there was no change in market quality as a result of this reduction in tick size.

The present paper examines the impact of a reduction in the minimum tick size on the Australian Stock Exchange (ASX) on 4 December 1995.[1] The present paper builds on the existing published literature in three ways. First, with the exception of two papers (discussed below), previous research that considers the impact of a reduction in tick size has examined the issue in markets with market makers. The present paper examines the issue in an order driven market without any market maker intervention. The issue is arguably more important in this context as limit orders provide the only source of market liquidity. Therefore, it is imperative that the tick size is set at a level that will encourage limit order placement and offer protection from free-riders.

The two previous papers that have considered the impact of tick size reduction on market liquidity in a market without market makers are Lau and McInish (1995) and Aitken *et al*. (1995). Lau and McInish (1995) consider a reduction in the minimum tick size on the Stock Exchange of Singapore in 1994. Their paper is limited by a very small sample comprising only three stocks over an 8-day window sampled at

[1] The ASX also reduced the minimum tick size for selected stocks on 28 October 1991. Only 41 of the 692 stocks in our 1991 sample experienced a change in the minimum tick size. Given the small sample size and the fact that all of these stocks were priced above $A5 it is difficult to identify suitable controls for these stocks. Furthermore, the control groups also exhibited changes in liquidity, making it difficult to isolate the impact of the minimum tick size change. For this reason we do not consider the impact of this change in tick size.

14:00 each day. The present paper extends their work by analysing a larger sample of stocks over a longer event window sampled every 30 min during the trading day. Aitken *et al*. (1995) examine stocks on the ASX that experience a change in tick size when their price moves above or below $A0.10. Their analysis is limited by the fact that it only considers very low priced stocks with high relative tick sizes. Furthermore, they only examine the impact of the change on bid ask spreads.

Second, the present paper uses a rich database, which allows for more detailed analysis of order depth and order exposure. Unlike previous published literature, which only considers the volume of orders at the best bid and ask price, our data allows us to examine all orders entered into the market. Using a liquidity proxy developed by Aitken and Comerton-Forde (2003) we analyse the change in overall depth of the market and the probability of execution. This allows us to identify the overall impact of the change in tick size on market liquidity. We are also able to identify the level of exposure of these orders. If a smaller tick size discourages order exposure we would expect to see greater use of market orders rather than limit orders and undisclosed orders and an increase in the percentage of trades executed off-market.

Third, the approach taken by the ASX in implementing the reduction in tick size on 4 December 1995 provides us with a control group of stocks that did not experience a change in tick size. The ASX operates a tiered tick regime, based on the price of the stock. Only three of the four tiers experienced a reduction in the minimum tick size on the event date. Therefore, we are able to use the fourth group to control for other extraneous factors that may have influenced liquidity around the event date.

An analysis of the impact of a reduction in tick size is particularly relevant at this time as the ASX has recently released a Market Consultation Paper[2] proposing further reductions in the minimum tick size for low priced stocks. Therefore, this research will be of interest to the ASX and its participants who are trying to assess the merits of this proposal.

2. Hypothesis development

In a competitive market, a reduction in the minimum tick size will give rise to a reduction in bid ask spreads. Investors will be able to place orders at tighter spreads. The reduction in tick size will be particularly important in stocks where the spread has previously been constrained by the minimum tick and where the relative tick size is high. However, even stocks that were not constrained by the minimum tick size may also experience a reduction in spread as investors place orders at prices that previously would have been unavailable. Previous published literature, including Goldstein and Kavajecz (2000), Bacidore (1997), Ahn *et al*. (1996, 1998), suggests that reductions in the minimum tick size do, in fact, give rise to reductions in the bid ask spread.

[2] ASX Market reforms – enhancing the liquidity of the Australian equity market, Market Consultation Paper, Australian Stock Exchange Limited (ASX 2003).

The ASX facilitates trading through the Stock Exchange Automated Trading System (SEATS). SEATS is a competitive and transparent electronic order book that trades continuously (from 10:00 to 16:00) from Monday to Friday, except at the opening.[3] Matching orders are automatically executed according to price then time priority. Orders may be amended or withdrawn and both market and limit orders may be entered. The reduction in tick size provides investors with the opportunity to place orders in the electronic order book at narrower price increments. Therefore, we hypothesize:

H_1: A reduction in the minimum tick size will lead to a reduction in the bid-ask spread.

A reduction in the minimum tick size reduces the premium paid to limit orders for providing liquidity to the market. As a result, investors and traders that previously placed limit orders at the best bid and ask price may now choose to place them further away from the best prices in order to ensure that they continue to capture a larger premium. They may choose to shift some or all of their order away from the best bid and ask price, therefore reducing the depth offered at these prices. Alternatively, impatient investors may now choose to use market rather than limit orders as the cost of demanding liquidity has been 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 prices.

H_2: A reduction in the minimum tick size will lead to a reduction in the depth at the best bid and ask prices.

Previous published literature has consistently documented reduced spreads and reduced depth at the best bid and ask price; however, given that these have conflicting effects on liquidity it is difficult to determine the overall impact of the change on liquidity. Several papers have developed measures to capture this overall impact on liquidity. For example, Goldstein and Kavajecz (2000) estimated the cost of demanding liquidity for various parcel sizes. They found that the combined effect of reduced spreads and reduced depths made small orders cheaper to execute, while large investors, particularly in low volume and low priced stocks, did not benefit. In contrast, Bacidore (1997) found that although spreads and depths declined, large investors were not harmed by the move to decimalization on the TSE. For this reason we hypothesize that the reduction in tick size will lead to a change in the level of liquidity, but we do not predict the direction.

H_3: A reduction in the minimum tick size will lead to a change in the level of market liquidity.

Investors and traders wishing to trade need to display limit orders in order to attract other investors and traders, or pay the bid ask spread if they wish to trade immediately.

[3] The ASX uses a pre-opening period for 2.5 h prior to the market open, during which time orders may be entered, amended and withdrawn but not executed. The market opens with a call, at which times all overlapping orders are executed.

By choosing to use limit orders, investors provide a free option to the market and risk having their order picked-off or front-run by quote-matchers (Harris, 1996). In a market with price then time priority, such as the ASX, the size of the minimum tick directly effects the protection afforded to these limit order traders. A large minimum tick size makes it costly for quote-matchers to front-run these orders. Using data from the TSE and Paris Bourse, Harris (1996) reports that larger tick sizes are associated with higher levels of order exposure.

To encourage investors to provide liquidity to the market, exchanges often provide special order and trade types to allow for partial display of order volume, upstairs trading and other such facilities. During the period under examination, the ASX allowed an undisclosed order type that enables investors to hide the volume of their order if the value exceeds $A25 000.[4] We anticipate that the use of this order type will increase if the reduction in tick size means that investors no longer have adequate protection from quote-matchers. ASX Business Rule 2.6(13) also allows trades to be executed off-market if the value of a single line of stock exceeds $A1 000 000 or if the value of a portfolio of at least 10 stocks exceeds $A5 000 000. If large investors are disadvantaged by the reduction in tick size we also expect an increase in the percentage of trades that are executed off-market. Alternatively, investors may choose not to expose their intentions to the market using limit orders, but rather trade using market orders. These arguments give rise to our fourth hypothesis.

H_4: A reduction in the minimum tick size will lead to a reduction in the level of order exposure.

3. Data

The data used in the present paper is taken from the SEATS database maintained by the Securities Industry Research Centre of Asia-Pacific.[5] The sample covers a 4-month window from 9 October 1995 to 9 February 1996. It is divided into a pre and post period centred on 4 December 1995, the date of the reduction in tick size. Consistent with previous research, such as Goldstein and Kavajecz (2000), the week of the reduction in the tick size is eliminated from the sample to allow a transition period for market participants to adjust their behaviour in response to the change.

A short event window is selected as it is anticipated that market participants will respond quickly to the reduction in tick size. Sensitivity analysis is conducted on

[4] Note that ASX increased the minimum size requirement for undisclosed orders to $A100 000 in October 1996 and $A200 000 in June 2001.

[5] Securities Industry Research Centre of Asia-Pacific (SIRCA) is a not for profit financial services research organization involving 25 universities in Australia and New Zealand. SIRCA provides its members with access to intraday order and trade data from the ASX. This data has been used extensively in the published microstructure literature. See for example Aitken *et al.* (1998).

Table 1
Relative tick sizes pre and post 4 December 1995

		Absolute tick size		Relative tick size	
Group	Price range ($A)	Pre ($A)	Post ($A)	Pre (%)	Post (%)
1	0.00–0.10	0.005	0.001	5–100	1–100
2	0.10–0.50	0.010	0.005	2–10	1–5
3 (Control)	0.50–10.00	0.010	0.010	0.1–2	0.1–2
4	10–50	0.020	0.010	0.2–0.4	0.02–0.1
5	50–100	0.050	0.010	0.05–0.1	0.01–0.02
6	100–999	0.100	0.010	0.01–0.1	0.001–0.01
7	Over 999	1.000	0.010	<0.1	<0.001

This table illustrates the relative tick size for each group of stocks before and after the reduction in the minimum tick size on 4 December 1995.

the length of the window using a 2-week, 1-month and 6-month window. These sensitivity tests provide results consistent with those reported in the present paper and, therefore, are not discussed.

Table 1 illustrates the tick size before and after the change on 4 December 1995 for each group of stocks. Note that all groups except group 3, stocks priced between $A0.50 and $A10.00, experienced a reduction in tick size on this date. Therefore, group 3 acts as a control group. The reduction in tick size should have no impact on the liquidity of the stocks in this group. All other groups are collectively referred to as the event groups.

It is noteworthy that the relative tick size varies significantly across the different groups of stocks. In both the pre and post period the relative tick size for stocks priced above $A10 was less than 1 per cent. Therefore, the cost of demanding liquidity in these stocks was relatively low, even before the tick size reduction. In contrast, the relative tick size in low priced stocks remains high, even in the post period. However, these stocks experienced significant reductions in the relative tick size. For this reason we anticipate that the impact of the reduction in tick size will be larger on the low priced stocks.

3.1. Sample selection

The initial sample includes all stocks that traded during both the pre and post periods. Stocks that moved from one tick group to another during the period, because of changes in price, are excluded from the sample and are the subject of further research. Stocks that traded less than an average of one trade per day are excluded from the sample. The final sample consists of 674 stocks. There are no stocks priced over $A50; therefore, the remaining analysis in the present paper only considers groups 1–4.

Table 2
Descriptive statistics

Group	Number of stocks	Market capitalization ($A000s)	Daily trading value ($A)	VWAP (A$)
Panel A: all stocks				
1	73	5832	11 317	0.03
2	197	23 503	32 794	0.20
3 (Control)	391	604 368	778 281	1.99
4	13	7 791 041	8 012 708	15.24
Panel B: low volume stocks				
1	16	3897	4624	0.03
2	95	19352	10 083	0.20
3 (Control)	279	1 48 208	55 821	1.68
4	7	2 402 272	2 54 617	15.21
Panel C: high volume stocks				
1	57	7121	18 014	0.04
2	102	26 917	55 122	0.21
3 (Control)	112	9 92 195	1 497 754	2.30
4	6	12 191 785	14 540 015	15.27

Panel A of Table 2 indicates the distribution of the sample stocks across the four tick groups. It provides the mean market capitalization, daily trading value and volume weighted average price (VWAP) for each group. Panel B and C illustrate the same statistics for the sample further partitioned into low volume and high volume stocks. Those stocks with trading volume greater than the median volume for the group are classified as high volume stocks and those with trading volume less than the median are classified as low volume stocks.

3.2. Descriptive statistics

The distribution of the sample stocks across the four groups is provided in Panel A of Table 2. The table illustrates that market capitalization and daily trading value increases monotonically with the price groups. Only 13 stocks fall into group 4; therefore, the validity of the results for this group might be reduced by the small sample.

The sample is further partitioned into low and high volume stocks. A stock is placed into the low volume group if its daily trading volume is below the median level for that group. Stocks with a daily trading volume in excess of the median for the group are placed into the high volume group. These results indicate significant differences in the size of the high and low volume stocks in each group. With the exception of group 3, the volume weighted average prices for the high and low volume groups are not significantly different.

4. Method

Liquidity is examined using three proxies: bid ask spread, depth at the best bid and ask price and the Aitken and Comerton-Forde (2003) weighted order book measure.

Bid ask spreads are estimated using a time-weighted absolute and relative bid ask spread (McInish and Wood, 1992). Depths at the best bid and ask price are also calculated by sampling the order book every 30 min during the trading day. In order to make depths comparable across stocks of different sizes we divide the volume of shares at the best bid and ask price by the total number of shares on issue. The Aitken and Comerton-Forde (2003) measure considers the value of all orders in the order book weighted by their probability of execution. This measure captures the four dimensions of liquidity identified by Harris (1994) and allows us to identify the overall impact of the reduction in tick size on liquidity.

Order exposure is also examined using three variables. The first measure considers the number of market orders as a percentage of all orders entered. The second measure considers the number of orders that have an undisclosed volume as a percentage of all orders that are eligible to be made undisclosed (i.e. exceed $A25 000).[6] The third measure examines the percentage of total trading volume that is executed off-market.

Each of these proxies are calculated on a daily basis during the sample period. The mean values are estimated for the pre and post period for each group of stocks. We use a paired *t*-test to test the difference between the pre and post period means for each stock.

5. Results

5.1. Hypothesis 1

Panel A of Table 3 provides details of the changes in the bid ask spread for each group of stocks before and after the reduction in the minimum tick size. Consistent with previous research, the results for the stocks priced below $A0.50 in groups 1 and 2 exhibit significant decreases in spreads. The average spread for group 1 stocks fell from $A0.0063 to $A0.0047 and for group 2 stocks fell from $A0.0169 to $A0.0145. An analysis of the mean spreads on a daily basis reveals a significant decline in spreads on the first day in the post period. Spreads remained lower throughout the post period. These results provide strong support for Hypothesis 1 that a reduction in the minimum tick size will give rise to a reduction in spreads.

In contrast, group 4 stocks exhibit an average increase in spreads of 30 per cent from $A0.19 to $A0.25. This increase might be a result of the fact that the relative tick size was already quite small prior to the reduction in the minimum tick. The average relative tick for these stocks was 0.13 per cent in the pre period compared to 16 and 5 per cent for groups 1 and 2, respectively. This reduction in tick size might have resulted in the minimum tick size falling below the optimal level for these stocks. Furthermore, the reduction in the tick size might have encouraged quote matching and free-riding in these stocks, resulting in uninformed investors placing their orders

[6] We also estimate the value of undisclosed orders as a percentage of the value of all orders that are eligible to be undisclosed. However, the results are consistent and, therefore, not reported.

Table 3
Liquidity measures

Group	Pre	Post	Difference	% Difference	*t*-statistic
Panel A: Bid ask spread ($A)					
1	0.0063	0.0047	−0.0016	−26%	−21.04**
2	0.0169	0.0145	−0.0024	−14%	−13.04**
3 (Control)	0.0401	0.0418	0.0017	4%	0.98
4	0.1930	0.2512	0.0582	30%	2.72**
Panel B: Volume at the best bid and ask price divided by issued capital (%)					
1	1.26	0.41	−0.85	−67.81%	−94.85**
2	0.36	0.24	−0.11	−31.53%	−61.28**
3 (Control)	0.15	0.15	0.00	0.53%	0.11
4	0.02	0.01	−0.01	−40.48%	−9.03**
Panel C: Weighted order book					
1	388 337	1 015 257	626 920	161%	56.70**
2	88 896	152 326	63 429	71%	41.83**
3 (Control)	73 597	77 610	4013	5%	1.28
4	36 026	45 473	9447	26%	11.13**

Table 3 provides details of three liquidity measures: bid ask spread, volume at the best bid and ask price and the Aitken and Comerton-Forde (2003) weighted order book measure before and after the change in the minimum tick size on 4 December 1995. The pre period is defined as 9 October 1995 to 3 December 1995 and the post period is defined as 11 December 1995 to 9 February 1996.
**Significant at the 0.01 level.

at wider spreads. However, the conclusions drawn from the results of group 4 are limited by the small sample size.

There is no significant change in the bid ask spread for the control group of stocks which indicates that the changes in the event groups are driven by the change in tick size, rather than other extraneous factors.

5.2. Hypothesis 2

Consistent with the prior published literature, all of the event groups exhibit a statistically significant decrease in the volume of orders at the best bid and ask price (Panel B, Table 3). An analysis of the change on a daily basis reveals that there was a large decline in depth on the first day in the post period for these stocks. Group 1 exhibits a 68 per cent decline, group 2 a 32 per cent decline and group 4 a 40 per cent decline in the volume of orders at the best bid and ask price. However, there is no change in the depth at the best bid and ask price in the control group. This provides further evidence of the fact that this change is driven by the tick size reduction.

The results suggest that following the reduction in the minimum tick size investors are less willing to expose aggressively priced orders. As suggested by Goldstein and Kavajecz (2000) investors might be shifting their limit orders to prices further away from the best bid and ask price in order to ensure that they receive an adequate

premium for supplying liquidity to the market. This issue is explored further through an analysis of the whole limit order book in Section 5.3.

5.3. Hypothesis 3

The results for the Aitken and Comerton-Forde (2003) weighted order book measure are illustrated in Panel C of Table 3. These results allow us to identify the net effect of the reduction in spreads and best bid and ask depth on total liquidity in the market. This measure considers both the value of the orders in the order book and the probability of their execution.

These results indicate that there is a significant increase in liquidity in all of the *event* groups. The largest increase in liquidity occurs in the lowest priced stocks. These stocks experienced a 161 per cent increase in liquidity following the reduction in the tick size. The magnitude of the increase in liquidity decreases as the stock price increases. This result is also consistent with the magnitude of the reduction in the relative minimum tick size. That is, the stocks with the largest reduction in the relative minimum tick size experience the largest increase in liquidity.

The increase in the weighted order depth for group 4 is somewhat puzzling given that these stocks exhibit an increase in spreads and a decrease in best bid and ask depth. This result is explored further in Section 5.5.

The control group of stocks does not exhibit any change in liquidity following the event date. This provides further evidence that the results for the event groups are driven by the change in tick size.

5.4. Hypothesis 4

Table 4 provides details of the changes in order exposure from the pre to the post period. With one exception, these results indicate that there is no significant change in the level of order exposure measured using the percentage of market orders, undisclosed orders and off-market trading. The only exception to this is a significant decrease in the percentage of undisclosed orders for stocks priced less than $A0.10. These results suggest that the change in the minimum tick size had no impact on the order exposure behaviour of investors.

5.5. Low and high volume stocks

Goldstein and Kavajecz (2000) indicate that the impact of a reduction in tick size is affected by the level of trading activity in the stock. Their results suggest that infrequently traded stocks should have a coarser price grid. For this reason we further partition our sample into low and high volume stocks in each of the event groups and repeat the analysis outlined above.

Table 5 presents the results for the low volume stocks. The bid ask spread results for the low priced stocks are consistent with the full sample. Spreads for groups 1 and

Table 4
Order exposure measures

Group	Pre	Post	Difference	% Difference	*t*-statistic
Panel A: Percentage of market orders					
1	2.27	2.32	5.12	2.26%	0.17
2	1.23	1.53	30.17	24.48%	−1.93
3 (Control)	1.87	1.98	11.76	6.30%	−1.59
4	2.21	1.87	−33.51	−15.17%	1.56
Panel B: Percentage of undisclosed orders					
1	0.73	0.53	−20.17	−27.59%	2.01*
2	0.77	0.88	11.14	14.46%	−1.25
3 (Control)	1.87	1.92	5.34	2.85%	−0.87
4	2.39	2.97	57.20	23.90%	−1.19
Panel C: Percentage of off-market trading					
1	0.00	0.02	1.06	216.48%	0.00
2	0.23	0.19	−3.89	−17.27%	0.00
3 (Control)	3.09	3.29	20.00	6.47%	0.00
4	7.58	8.25	66.39	8.76%	0.01

Table 4 provides details of three order exposure measures: the percentage of market orders, the percentage of undisclosed orders and the percentage of off-market trading before and after the change in the minimum tick size on 4 December 1995. The pre period is defined at 9 October 1995 to 3 December 1995 and the post period is defined as 11 December 1995 to 9 February 1996.
*Significant at the 0.05 level.

2 decline; although the magnitude of the change was smaller than for the sample as a whole. For group 4 the spreads increased by 33 per cent from $A0.39 to $A0.52. The spreads are considerably higher than the sample as a whole. The difference in these results is potentially explained by the fact that the relative minimum tick size in the low priced stocks in groups 1 and 2 was very large prior to the change and, therefore, the reduction allowed investors to narrow the spread. In contrast, in the high priced stocks in group 4 the relative minimum tick size was less than 0.4 per cent prior to the change and less than 0.1 per cent after the change. In the low volume stocks in group 4 this change reduced the tick size below the optimal level; therefore resulting in investors widening the spread in order to protect themselves from quote matchers.

Consistent with the full sample, the low volume stocks displayed a reduction in the volume of shares at the best bid and ask depth. Group 1 fell by 48 per cent, group 2 by 22 per cent and group 4 by 44 per cent.

The results for the Aitken and Comerton-Forde (2003) weighted order book measure are also consistent with the full sample for groups 1 and 2. However, the low volume stocks in group 4 exhibit a significant reduction in overall liquidity. These results are consistent with Goldstein and Kavajecz (2000) who report that investors in low volume stocks do not benefit from the reduction in tick size.

Table 6 presents the results for the high volume stocks. Like the low volume stocks, the direction of the results for groups 1 and 2 are consistent with the full

Table 5
Liquidity measures for low volume stocks

Group	Pre	Post	Difference	% Difference	*t*-statistic
Panel A: Bid ask spread ($A)					
1	0.007	0.006	−0.001	−15%	−8.69**
2	0.021	0.019	−0.002	−9%	−5.68**
4	0.390	0.520	0.130	33%	2.77**
Panel B: Volume at the best bid and ask price divided by issued capital (%)					
1	0.8593	0.4478	−0.4114	−48%	−53.70**
2	0.2985	0.2340	−0.0645	−22%	−28.84**
4	0.0307	0.0171	−0.0137	−44%	−7.91**
Panel C: Weighted order book					
1	129465	432708	303 243	234%	38.37**
2	25012	58145	33 133	132%	48.17**
4	6990	6156	−834	−12%	−2.10*

Table 5 provides details of three liquidity measures: bid ask spread, volume at the best bid and ask price and the Aitken and Comerton-Forde (2003) weighted order book measure before and after the change in the minimum tick size on 4 December 1995. The stocks included in this sample are low volume stocks with trading volumes of less than the median trading volume for the full sample of stocks in a given group. The pre period is defined as 9 October 1995 to 3 December 1995 and the post period is defined as 11 December 1995 to 9 February 1996.
**Significant at the 0.01 level.
*Significant at the 0.05 level.

sample results; although the magnitude of the changes are much larger. However, the high volume stocks in group 4 exhibit no change in the bid ask spread, a reduction in depth at the best bid and ask prices and an increase in the overall liquidity for these stocks. This result suggests that in high volume, high priced stocks investors increased the volume of orders being placed at prices away from the best bid and ask price. This may reflect an attempt by these investors to capture a larger premium for providing liquidity through limit orders. Our analysis of the high and low volume stocks support Goldstein and Kavajecz (2000), which indicates that high volume stocks should have smaller minimum tick sizes than low volume stocks in the same price band. They also suggest that this allows trading costs to be reduced in high volume stocks while providing incentives for liquidity provision in low volume stocks. Our results indicate that improvements in liquidity following the decrease in tick size are greatest in high volume stocks. Reducing tick size too much, particularly in low volume stocks with smaller relative tick sizes may even reduce the provision of liquidity.

6. Conclusions and future research

The present paper examines the impact of a reduction in tick size for stocks priced below $A0.50 and above $A10. Stocks priced between $A0.50 and $A10 experienced no change in tick size; therefore providing a control group. An analysis of liquidity

Table 6
Liquidity measures for high volume stocks

Group	Pre	Post	Difference	% Difference	*t*-statistic
Panel A: Bid ask spread ($A)					
1	0.006	0.004	−0.002	−37%	−23.53**
2	0.013	0.010	−0.003	−22%	−17.95**
4	0.031	0.029	−0.001	−4%	−0.80
Panel B: Volume at the best bid and ask price divided by issued capital (%)					
1	1.6610	0.3628	−1.2981	−78%	−83.44**
2	0.4127	0.2538	−0.1589	−39%	−55.35**
4	0.0070	0.0051	−0.0019	−27%	−6.15**
Panel C: Weighted order book					
1	648 103	159 9819	951 715	147%	46.73**
2	151 181	244 148	92 967	61%	31.93**
4	58 728	75 015	16 288	28%	11.20**

Table 6 provides details of three liquidity measures: bid ask spread, volume at the best bid and ask price and the Aitken and Comerton-Forde (2003) weighted order book measure before and after the change in the minimum tick size on 4 December 1995. The stocks included in this sample are low volume stocks with trading volumes of less than the median trading volume for the full sample of stocks in a given group. The pre period is defined at 9 October 1995 to 3 December 1995 and the post period is defined as 11 December 1995 to 9 February 1996.
**Significant at the 0.01 level.

and order exposure in the control group revealed no significant difference in the measures before and after the event date. As a result, changes in the event groups may be attributed to the reduction in the minimum tick size.

Consistent with previous research, the stocks priced below $A0.50 exhibited significant decreases in bid ask spreads and volumes at the best bid and ask prices. Using a new proxy for liquidity, which considers the four dimensions of liquidity identified by Harris (1994), we find that these stocks displayed an overall increase in liquidity. This increase was greatest in the high volume stocks. Surprisingly, these stocks did not experience any change in order exposure behaviour.

The analysis of stocks priced greater than $A10 produced some puzzling results. Rather than the expected decrease in spreads, spreads increased by approximately 30 per cent. By partitioning these stocks into two groups based on trading volume we illustrated that this result was driven by low volume stocks. These stocks exhibited increased spreads, decreased depth and an overall decrease in liquidity. This result suggests that the tick size was reduced below the optimal level for these stocks. In contrast, high volume stocks in this group displayed increased liquidity.

The results suggest that the current ASX proposal to further reduce tick sizes in low priced stocks with high relative tick sizes is likely to give rise to increases in liquidity in these stocks. ASX may, however, wish to consider a tick size based on both price and volume rather than a simple price based mechanism.

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