

NZX Joins the Race to Minimise Tick Size

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In 2011, the New Zealand Exchange (NZX) reduced the minimum tick size from \$0.01 to \$0.005 for seventeen dual-listed and property stocks, with the stated objective of boosting NZX liquidity. After controlling for firms matched on similar liquidity characteristics, both spread and depth significantly decline, and there is some evidence of higher turnover. However, smaller firms do not enjoy the same liquidity benefits as larger firms. For example, smaller firms and those with greater illiquidity prior to the tick change, experienced deterioration in turnover after the change.

Keywords: Tick size, Liquidity, Spread, Depth, Turnover

1. Introduction

In March 2011, the NZX joined a world-wide race to minimise tick size. Tick size, the smallest incremental change in a share price has been sliced and diced by numerous stock exchanges around the world over the last two decades. The American Stock Exchange initiated this trend in 1992 by reducing tick size from 1/8th in a dollar to 1/16th for low priced stocks, before progressively rolling it out all stocks by 1997. The New York Stock Exchange whose tick size had remained unchanged for more than 200 years adopted the 1/16th tick size in 1997, which was further reduced to one cent in 2001. The race to ever lower tick sizes has been joined by numerous stock exchanges around the world, including those in Australia, Canada, United Kingdom, Tokyo, Taiwan and Hong Kong.

When extending the initial pilot scheme in October, 2011, Mark Weldon (former CEO of NZX) announced:

"...the reduced price steps had a positive impact on liquidity in the (initial five) selected stocks, which is good news for the companies, for investors and our wider markets. ... We expect to see the same positive liquidity impact for these (additional 12) stocks too."

The scheme matches a similar 2005 ASX half-cent tick change that made it attractive for institutional investors to transact dual-listed stocks such as Telecom on the ASX

rather than NZX. As the head dealer for Craigs Investment Partners stated,

"Having to leave half-a-cent in Australia is detrimental to New Zealand liquidity". And this is "one of the major, but unspoken reasons why the scheme was introduced." (Krupp, 2011)

Investors are likely to be interested in bid-ask spread and depth as these directly impact on their total trading costs and ability to trade at the best available prices. International empirical studies typically show conflicting liquidity impacts when tick size is reduced, with spread narrowing (Chung, Charoenwong, and Ding, 2004; Aitken and Comerton-Forde, 2005) but depth at the best available prices declining (Goldstein and Kavajecz, 2000; Pan, Song and Tao, 2012). In contrast to investors, stock exchanges' key motive for changing tick size is to boost turnover as a significant portion of their income is derived from turnover. However, the theoretical and empirical literature surrounding turnover changes is mixed. On one hand, reducing spreads and therefore lower trading costs may encourage investors to trade more, thereby boosting turnover. While on the other, liquidity providers may place orders further from the best available prices to protect their return or simply discontinue providing liquidity in the form of

limit orders thereby reducing trading activity (Harris, 1997). Ahn, Cao, and Choe, (1996) find no change in trading activity in AMEX stocks, while Hsieh, Chung and Lin (2008) find significant declines in trading activity in Taiwan when tick size is reduced.

In addition, research also reveals that the liquidity benefits of lowering tick size are not shared equally by firms. Larger firms with higher trading volume and those that consistently trade at spreads equal to the minimum tick size prior to the change enjoy the greatest liquidity improvement (Chung, Charoenwong, and Ding, 2004). In contrast, smaller firms with low trading volumes experience a worsening of liquidity (Aitken and Comerton-Forde, 2005).

2. Data & Method

The three main liquidity variables used to explore the change in tick size impact in this paper are: percentage quoted spread, depth and turnover. The percentage quoted spread is calculated as follows:

$$\text{Quoted spread \%} = \frac{(\text{Ask}_{j,t} - \text{Bid}_{j,t})}{(\text{Ask}_{j,t} + \text{Bid}_{j,t})/2} \quad (1)$$

where $\text{Bid}_{j,t}$ and $\text{Ask}_{j,t}$ are the closing bid and ask quotes for stock j on day t . Depth is the dollar value of depth at the best available bid and ask quotes immediately prior to each trade. Daily depth is then calculated for each stock by averaging the depth immediately prior to all trades in a given day. The third measure, turnover, is the aggregate dollar value of all trades in a stock on a given day.

An event study method similar to Ahn, Cao, and Choe, (1996) compares the daily average for a liquidity variable by stock over the 120 trading days prior to the effective date (pre-period) of the tick change with 120 trading days after this date (post-period). The average across all eligible

3. Findings

This section first discusses the liquidity metrics that investors are likely to be concerned with, followed by the liquidity metric stock exchanges are most interested in. As previously mentioned, investors are likely to be concerned with the cost of trading (spread) and their ability to execute their orders at the best available prices (depth). In contrast, stock exchanges will be more interested in turnover which is a key determinant of their revenue.

The final pool of 17 firms eligible to trade at half-cent increments include some of the NZX's largest, most frequently traded stocks such as Telecom and Auckland Airport through to small, illiquid stocks like Kermadec Property Fund and CDL Investments (see Appendix for the complete list of eligible stocks). Understanding the impact of reducing the minimum tick on stocks exhibiting these varying size and liquidity characteristics can inform future policy decisions. This paper shows that not all eligible firms enjoy the same liquidity improvements. Smaller stocks and those with greater illiquidity prior to the tick change tend to fare worse after the reduction in tick size compared to larger more liquid stocks.

stocks in the pre- and post-periods are reported in Table 1. Given the relatively small sample sizes, the Wilcoxon signed rank test measures the statistical significance between pre- and post-period differences for each liquidity variables.

To control for possible market wide liquidity changes over the period examined, each eligible stock in the sample is also matched with a stock that is not eligible to trade at half cent increments. For each eligible stock, an ineligible stock is selected that is matched on size and liquidity characteristics. Wilcoxon-Mann-Whitney z-score is used to test whether the difference of differences is significant.

The daily closing stock prices, market capitalisation, turnover and closing bid and ask prices are obtained from the NZX Company Research Database. Depth at the best bid and ask prices immediately prior to each trade is obtained from Securities Industry Research Centre of Asia-Pacific (SIRCA) for each stock.

Table 1 reports the pre- and post-period averages for the three liquidity variables, along with the difference between these two periods. Panel A and B show the averages for the eligible and ineligible matched control stocks respectively, while Panel C highlights whether the difference of differences between these two samples is significant.

Table 1: Changes in Stock Liquidity Characteristics

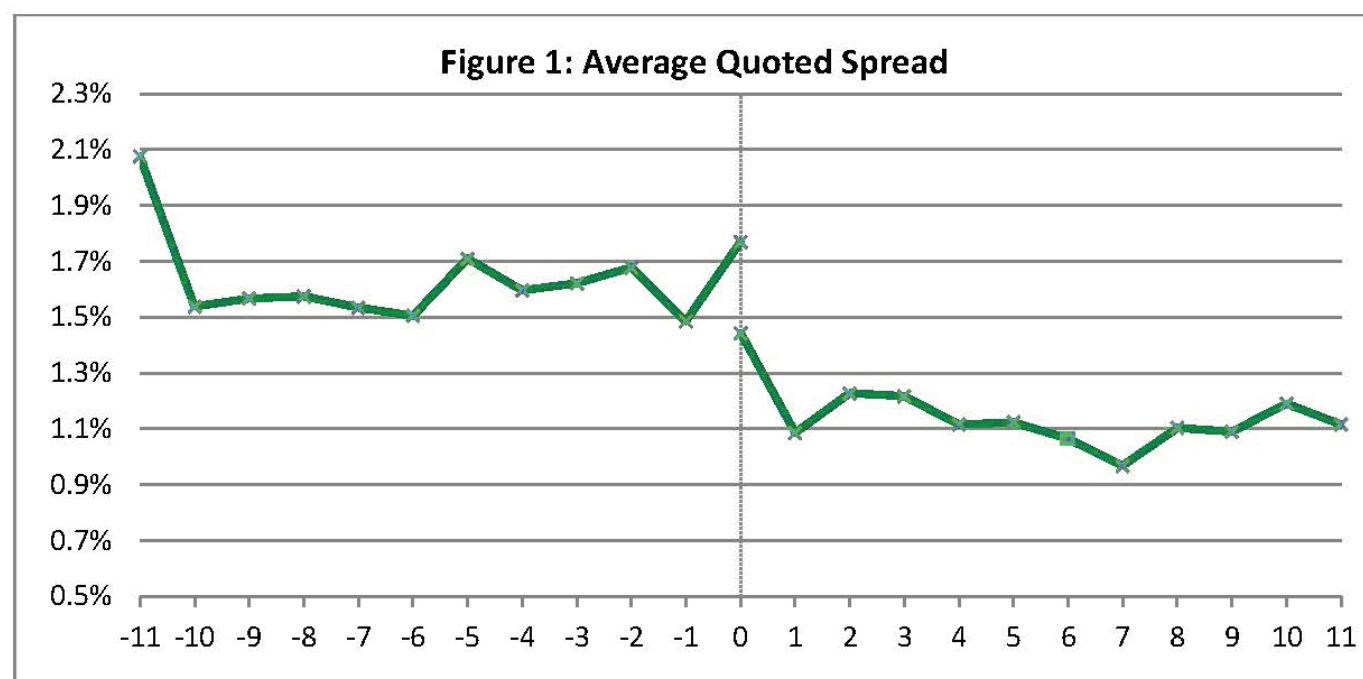
Panel A: Eligible Stocks				
	Pre-period	Post-period	Difference	Signed Rank p-value
Percentage Quoted Spread	1.62%	1.15%	-0.47%	0.000 ***
Dollar depth	\$141,893	\$70,844	-\$71,049	0.000 ***
Turnover	\$2,061,335	\$2,667,746	\$606,411	0.089 *
Panel B: Ineligible Matched Control Stocks				
	Pre-period	Post-period	Difference	Signed Rank p-value
Percentage Quoted Spread	1.26%	1.43%	0.17%	0.081 *
Dollar depth	\$31,039	\$27,996	-\$3,043	0.045 **
Turnover	\$1,872,075	\$2,171,774	\$299,699	0.644
Panel C: Difference of Eligible less Matched Control Stocks				
	Eligible Stocks	Control Stocks	Difference	z-score
Percentage Quoted Spread	-0.47%	0.17%	-0.64%	-4.33 ***
Dollar depth	-\$71,049	-\$3,043	-\$68,006	-3.89 ***
Turnover	\$606,411	\$299,699	\$306,712	1.38

In the period leading up to the tick change, the average quoted spread for eligible stocks was 1.62% and this drops to 1.15% when half-cent tick size is allowed. While the 0.47% decrease in spread is statistically significant, it also represents an economically significant reduction in investor trading costs. Multiplying each stock's change in spread by its average daily volume after the tick reduction reveals an average daily saving of \$108,937 or more than \$27 million per annum. However, investors trading in the larger firms

capture over 90% of these trading cost savings (8 of the 17 stocks are characterised as large based on a market capitalisation over \$500 million).

In contrast to those stocks eligible to trade at half-cent increments, the ineligible matched stocks experienced a marginal significant increase in spreads of 0.17% over the same period. As such, the eligible stock spread reduction is not due to some market wide effect.

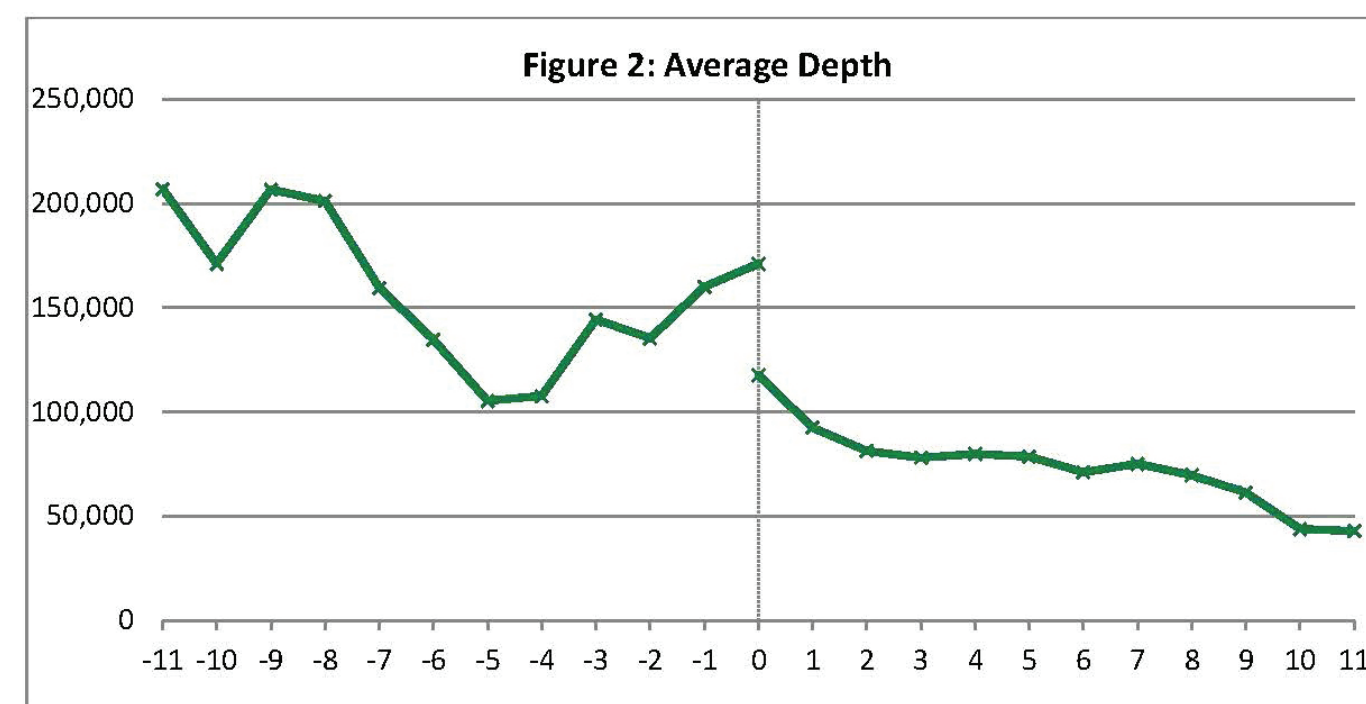
Figure 1 graphically shows the average quoted spread over 24 fortnightly intervals centred on the effective tick size change period (represented by the vertical line in Figure 1). The graph clearly highlights an immediate reduction in quoted spread after stocks became eligible to trade at half cent increments, and these smaller spreads persist for the next six months.



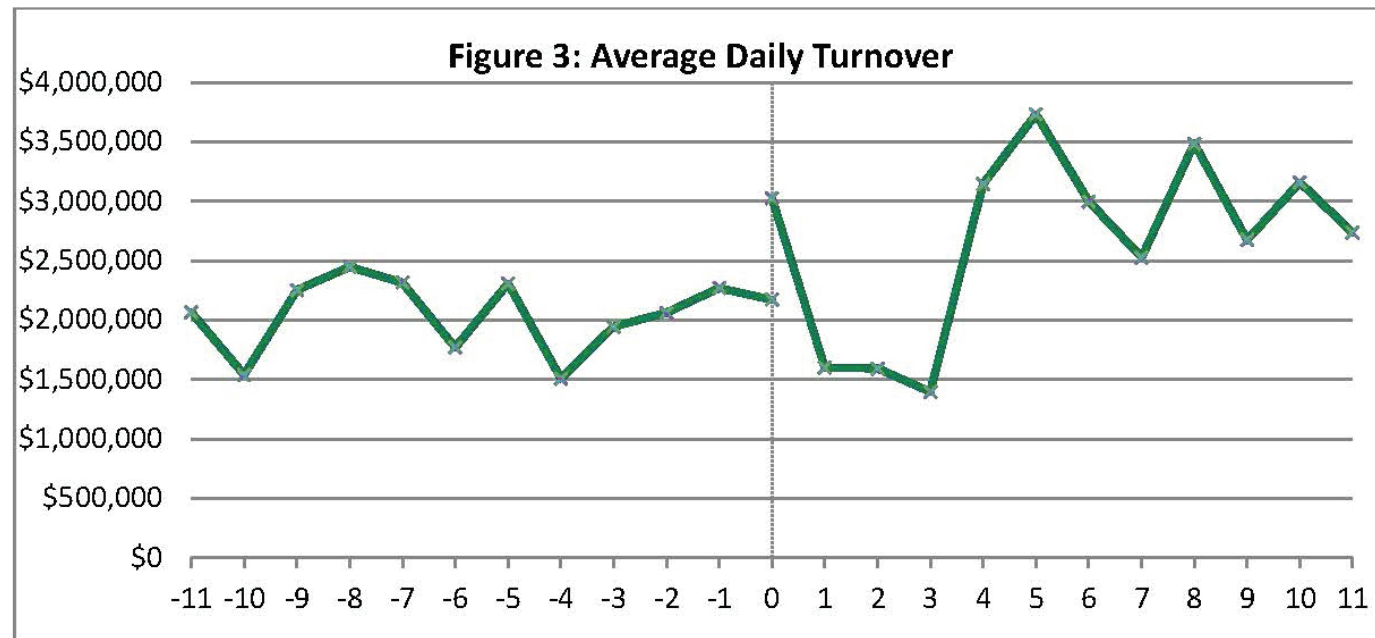
Investors may also be concerned with the ability to fill their orders at the best available prices. Lower depth means that investors may have to go deeper into the order book when seeking to fill market orders. Table 1 highlights that average depth in the post-period is less than half that in the pre-period. Reduction in depth remains significant, even after controlling for a possible general market related reduction in depth as shown in Table 1, Panel C.

However, one could reasonably expect depth to halve, given the halving of the tick size. This analysis can't rule out the possibility that the combined depth within one cent range on the bid and ask is not significantly different to the pre-period depth. To gain further insight into the

impact on depth Figure 2 shows average depth over 12 fortnightly periods on either side of the half-cent effective date. Average depth immediately prior to a trade falls substantially during the first two weeks of the half cent tick change as shown on the vertical line. However, depth consistently falls throughout the six month post-period examined. In fact, depth in the last month examined, is approximately a quarter of the average pre-period depth, making it increasingly difficult for investors to fill orders at the best available prices. This would imply that investors would have to split their trades into smaller parcels to ensure they execute their orders at the best price available. And this is what happened. The average trade size in dollars dropped by 19% on average during the post-period.

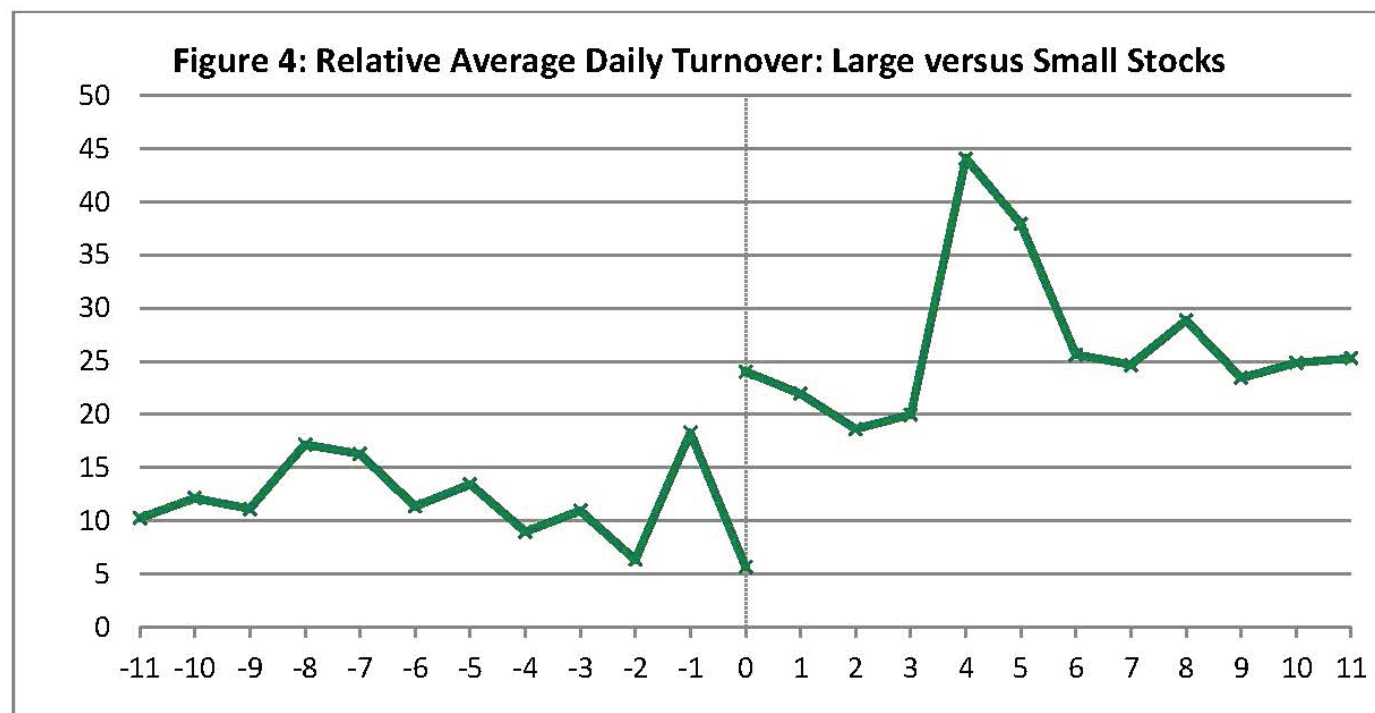


As mentioned in the introduction, the NZX's primary motivation to reduce tick size would be to boost turnover as this directly impacts on their revenues. We find that average daily turnover across all eligible stocks is 29.4% higher after the change. Figure 3 shows the average daily turnover for eligible stocks during fortnightly intervals. We see that after an initial boost in turnover immediately after the tick change, turnover then slumped before recovering to higher than pre-period levels during the 3-6 month period.



However, the matched ineligible stocks also experienced a 16% increase in turnover, and after controlling for the general market improvement in turnover, the increase is no longer significant. This though assumes that the change in turnover is uniform across all stocks. In unreported analysis, eligible small firms (less than \$500 million market capitalisation) actually experience a decline in turnover, but this decline is not evident in the ineligible matched small

firms' turnover. Figure 4 which shows the relative average daily turnover of the large stocks compared to small stocks, highlights the improvement (deterioration) in turnover for larger (smaller) eligible stocks. In the pre-period, large firm turnover is under 11.8 times that of small firms on average. This jumps to an average to more than 26 times in the subsequent six months. Therefore, it is the larger firms that experience the greatest improvement in turnover.



In unreported bivariate regression results², where change in turnover is the dependent variable and pre-period stocks characteristics are the independent variables, these also

confirm that smaller and less liquid stocks do not enjoy the same liquidity benefits as their larger counterparts. For example, a common illiquidity measure proposed by

Amihud (2002) is significantly negatively related to turnover. That is, stocks with lower pre-period illiquidity (i.e. are more liquid) enjoy greater improvements in turnover in the post-period. Also, larger firms and those with greater pre-

period depth enjoy significant improvements in post-period turnover.

4. Implications

This paper helps shed light on the impact of tick size changes on firms with differing size and liquidity characteristics. Relatively smaller stocks and those with less liquidity did not enjoy the same liquidity improvements after the minimum tick size was reduced to half-a-cent. The economically substantial transaction cost savings are predominantly captured by investors trading in larger stocks, and these larger stocks also enjoy significantly higher turnover comparative to small stocks. This has important implications for future policy decisions regarding tick size changes, and care should be taken when determining which stocks are eligible for any future tick changes.

This research also supports the current United States debate surrounding tick size, particularly for smaller less liquid stocks. While tick changes have been a one-way race to miniaturisation over the last two decades, the Securities Exchange Commission (SEC) is currently reviewing the tick

size in its securities markets, raising the possibility of larger minimum tick size increments for some stocks. It is hoped that increasing tick size will increase the spread between the bid and ask quotes. Wider spreads would enhance market makers' profitability and encourage them to increase quote size; thereby potentially improving market depth and turnover. Further, the higher profits may revive interest in funding analyst research on small stocks, which may lead to increased interest and liquidity in these stocks.

In May 2013, the Spread Pricing Liquidity Act of 2013 (known as the Tick Size Bill) was introduced in the House by Congressman David Schweikert. The bill if passed into law, would give issuers of less than US\$500 million and an average daily trading volume under 500,000 shares, the ability to elect to have their stocks trade at either 5 or 10 cent increments. So perhaps the race for ever smaller tick size has been run.

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Appendix: Institutional Background

The NZX announced on February 23, 2011 a pilot programme to reduce the minimum tick size from one-cent to half-a-cent for five stocks as shown in the table below. Trading on the new lower tick size was effective from the March 10, 2011. Then on October 23, 2011, the NZX announced that it would extend the programme to

include 12 further stocks comprising a mixture of stocks listed on both the NZX and ASX, plus property stocks whose share price was less than \$2.50. The 12 additional stocks shown in the table below could trade at the half-cent minimum tick size from November 7, 2011.

March 10, 2011 Effective Change in Tick Size	November 7, 2011 Effective Change in Tick Size
Auckland International Airport	Air New Zealand
Fisher & Paykel Appliances	AMP NZ Office
Guinness Peat Group	Argosy Property Trust
Kiwi Income Property Trust	CDL Investments
Telecom	DNZ Property Fund
	Goodman Property Trust
	Infratil
	Kermadec Property Fund
	National Property Trust
	New Zealand Oil & Gas
	Property for Industry
	Vital Healthcare Property Trust

Notes

1. This article is in part based on Anderson and Peng (2013).
2. Available from the author on request.

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