

MARKET INSIGHTS

The Impact of an Increase in Minimum  
Tick in the ASX 3 Year Commonwealth  
Treasury Bond Futures Contract



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# The Impact of an Increase in Minimum Tick in the ASX 3 Year Commonwealth Treasury Bond Futures Contract

*Dr Andrew Lepone and Anthony Flint*

## EXECUTIVE SUMMARY

This paper analyses the change in market quality after the increase in minimum tick on the 11th May, 2009 in the ASX 3 Year Commonwealth Treasury Bond Futures Contract. Comparing trading activity, liquidity, volatility and market impact costs before and after the structural change, we find that:

- Overall, trading activity has increased since the increase in minimum tick. The average daily trading volume after the tick size change has increased compared to the prior period, while the average trade size has slightly decreased relative to the same period last year. This same level of increase in trading activity was not witnessed in the ASX 10 Year Commonwealth Treasury Bond Futures contract (the control contract) over the same period.
- The average bid-ask spread is now trading around the minimum tick at 1.02 basis points, compared to 0.53 basis points before the increase.
- Quoted depth is significantly higher after the increase in the minimum tick, both at the best bid and ask, as well as total quoted depth. Quoted depth was found to be higher than the control period. Increase in the best and total depth was also seen in the 10 Year Commonwealth Bond Futures contract, but of a lesser magnitude. The magnitude of the improvement in the 10 Year Commonwealth Treasury Bond Futures contract suggests that market-wide impacts cannot account for the change in liquidity for the 3 Year Commonwealth Treasury Bond Futures contract.
- The average daily price range is approximately equal before and after the reduction in minimum tick, providing traders with ample trading opportunities.
- Slippage costs associated with trades of all sizes are approximately equal around the increase in minimum tick. The increase in the minimum price increment did not impact on the transaction costs for small, medium and large orders.

Analysis of trading activity, liquidity, volatility and market impact costs was undertaken for a control period (May to August 2008) and a control contract (the 10 Year Commonwealth Treasury Bond Futures contract). The comparative results for the control period and control contract indicate that the improvement for the 3 Year Commonwealth Treasury Bond Futures contract liquidity can not be attributed to macro-economic or market-wide effects.

These findings suggest that the increase in minimum tick has led to an improvement in liquidity, while still providing traders with ample trading opportunities.

## Introduction

On 11 May, 2009 ASX reverted to full basis-point trading in the 3 Year Commonwealth Treasury Bond Futures contract<sup>1</sup>. In addition to the increase in minimum tick, the level of pre-trade transparency was decreased, from five to three price levels. The re-introduction of the minimum price increment to 0.01% followed a review of market liquidity in credit environments during the financial crisis, as measured by bid and offer volume, price slippage and trading activity.

This study examines changes in liquidity and trading costs to determine if the increase in minimum tick and associated decrease in transparency has impacted on market quality.

## Method

To examine the impact of the change in market structure, we examine 5-minute snapshots for each day (night) over two 3 month periods. The pre-period is 10 February, 2009 to 10 May, 2009 and the post-period is 13 May, 2009 to 13 August, 2009. To control for any seasonal patterns in trading, and to provide a more robust analysis, we also examine the period 13 May, 2008 to 13 August, 2008 (the 'Control Period'). We analyse changes in trading activity, bid-ask spreads, quoted depth and volatility in the periods before and after the change to full-basis point trading for the 3-Year Commonwealth Treasury Bond Futures contract. These variables are measured over 5-minute intervals for the day (night), and then averaged over each trading day and then averaged again over the entire period to provide an average measure for each contract examined. Consistent with prior literature, we exclude the 5 days prior to expiration and restrict analysis to the nearest expiry contract only.<sup>2</sup>

## Trading Activity

An important consideration for all institutions is the liquidity of the contracts which they trade. Contract liquidity affects bid-ask spreads and quoted depth, which in turn affect trading costs and thus profit. The average on-market trade size and average daily volume transacted are presented in Figure 1 (Panel A). The average trade size of 30 contracts is higher than in the pre-period, although it is lower relative to the average trade size of 33 contracts in the May to August 2008 period. The average on-market daily volume of 51,461 contracts in the post period is higher than the pre-period, while a year-on-year comparison also indicates that daily volume is higher after the change in market structure. This increase in on-market daily volume also occurs during the night trading session (Panel B). Overall, on-market trading activity has grown since May 2009, which corresponds to the increase in minimum tick.

1 Reducing the minimum price increment was first introduced for non-roll periods in December 2006. The halving of the minimum price increment was undertaken to reduce customer transaction costs associated with crossing the bid offer spread.

2 See Berkman, H., Brailsford, T. and Frino, A., 2005, "A note on execution costs for stock index futures: Information versus liquidity effects", *Journal of Banking and Finance* 29, 565-577.

Figure 1, Panel A  
 AVERAGE TRADE SIZE AND AVERAGE VOLUME DURING DAY TRADING

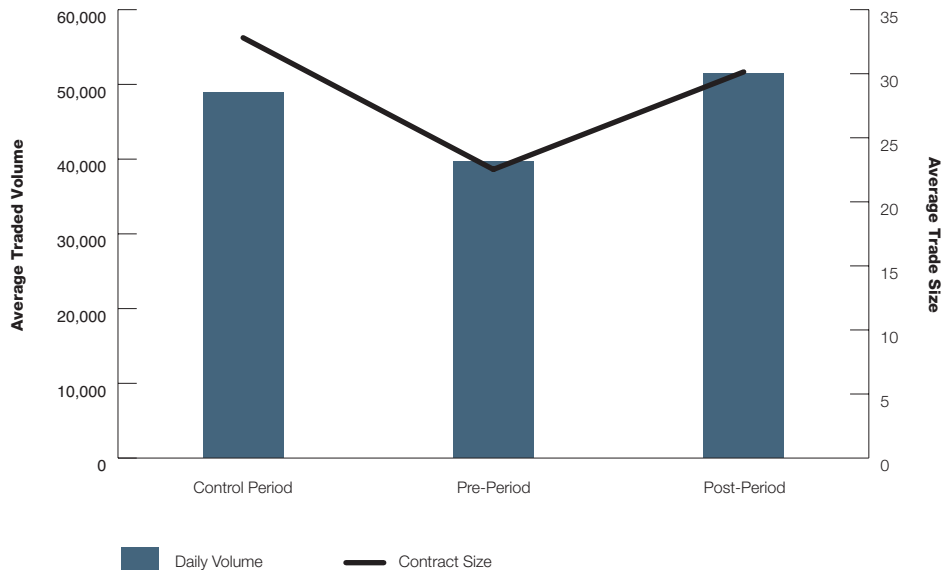
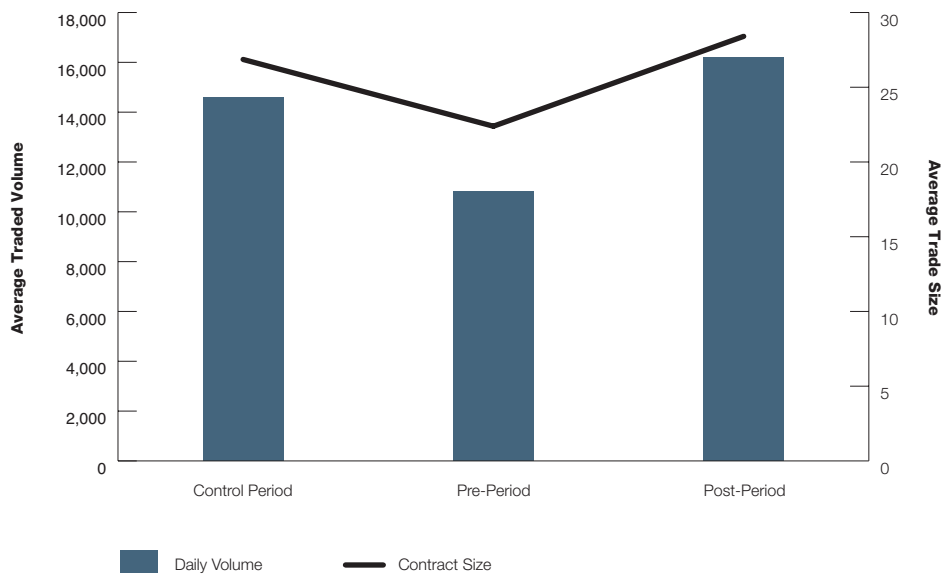


Figure 1, Panel B  
 AVERAGE TRADE SIZE AND AVERAGE VOLUME DURING NIGHT TRADING



## Bid-Ask Spreads and Quoted Depth

Prior to the move to full-basis point trading, the 3 Year Commonwealth Treasury Bond Futures contract were trading at an average of 0.53 basis points. After the tick size increase, spreads during the day trading session widened to an average of 1.02 basis points, as can be seen in Figure 2 (Panel A). Bid-ask spreads during the night trading session (Panel B) have also widened to above the minimum tick (1.19 basis points). Although the increase in minimum tick has significantly widened bid-ask spreads both during the day and night trading sessions, trading still occurs close to the new minimum tick.

With the introduction of wider pricing intervals, it is expected that depth will increase at the best bid and ask prices. Results in Figure 2 (Panel A) show that average depth at the best bid and ask quotes, during the day trading session, is significantly higher after the increase in minimum tick, rising from 291 contracts during the pre-period to 1,179 contracts after the change. Further, total depth visible in the order book has increased after the structural change. This improvement in quoted depth is also evident in the night trading session (Panel B).

Figure 2, Panel A  
 AVERAGE BID-ASK SPREADS AND QUOTED DEPTH DURING DAYTRADING

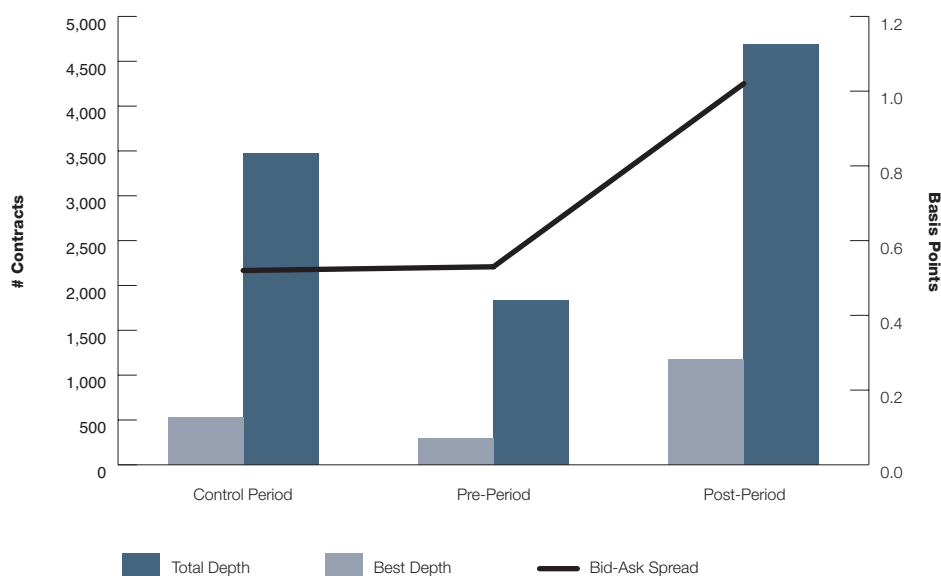
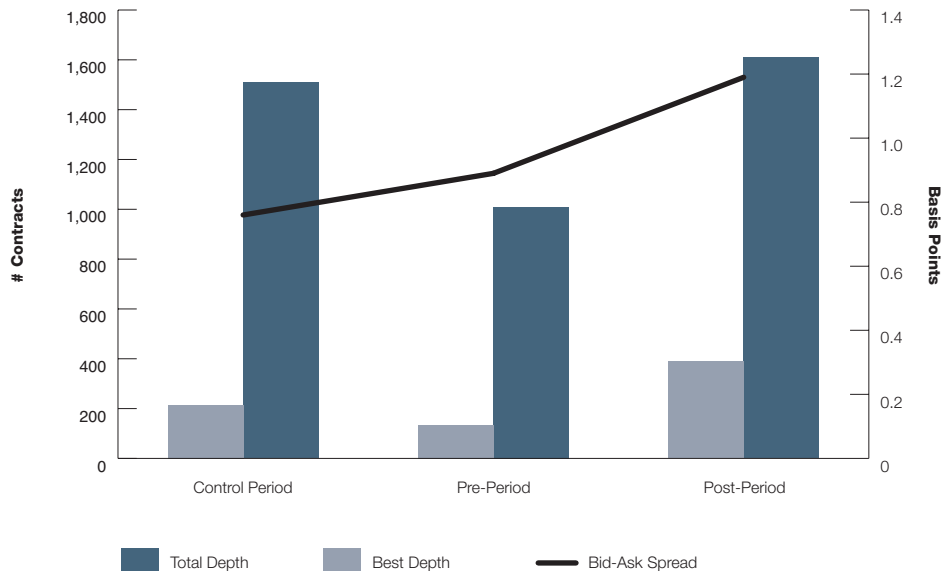


Figure 2, Panel B  
AVERAGE BID-ASK SPREADS AND QUOTED DEPTH DURING NIGHT TRADING



## Volatility

Volatility provides traders with trading opportunities, with higher volatility providing greater profit potential. Results presented in Table 1 indicate that volatility, in both the day and night trading sessions, is approximately equal before and after the change in market structure. The average daily range of 9.62 basis points in the post period is insignificantly different from 9.921 basis points in the pre-period. Also, the change in daily standard deviation of returns is minimal, being 0.043 percent before the change and 0.033 percent after the change. The increase in minimum tick has not altered the profit making potential in the 3 Year Commonwealth Treasury Bond Futures contract.

Table 1  
AVERAGE VOLATILITY DURING DAY AND NIGHT TRADING SESSIONS

	August 2008	May 2009	August 2009
<b>Panel A : Day Trading</b>			
Average Daily Range (B.P.)	8.04	9.921	9.62
Standard Deviation of Returns (%)	0.043	0.043	0.033
<b>Panel A : Night Trading</b>			
Average Daily Range (B.P.)	7.29	8.76	9.00
Standard Deviation of Returns (%)	0.028	0.039	0.034

## Slippage

Results indicate that bid-ask spreads are wider and quoted depth is higher after the increase in minimum tick. To determine which of these effects dominate, we estimate the on-market cost, or 'slippage', of executing orders before and after the structural change. Slippage is defined as the extent to which the execution of a large order adversely affects the futures price. Slippage is an implicit cost of trading and is a primary determinant of profitability. To minimise slippage, institutions frequently break up large orders into a sequence of smaller trades executed over a period of time. The data used in this paper allow us to identify trades belonging to the same order. Our analysis focuses on slippage estimates for orders as opposed to individual trades (see Appendix 2). To examine slippage costs associated with different sized orders, we separate all orders into four mutually exclusive groups based on order size.

Figure 3

### AVERAGE SLIPPAGE

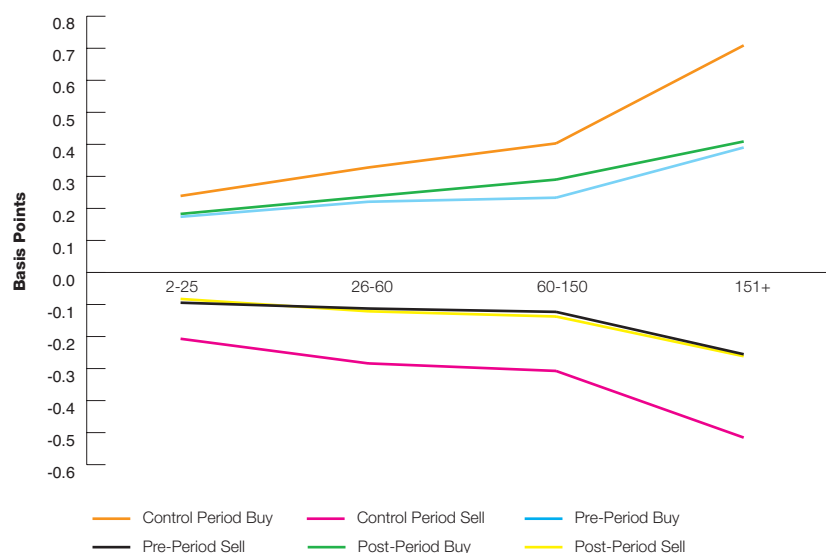


Figure 3 presents slippage estimates for the four order size quartiles. There is an insignificant change in the cost of executing orders across the four quartiles from the pre-period to the post-period. Slippage costs for buy orders in the smallest trade size quartile (2 contracts to 25 contracts) increase from 0.1739 to 0.1828 basis points while sell orders decrease from -0.0944 to -0.0826 points. Looking at the largest trade size quartile (greater than 150 contracts), there is an insignificant increase in the cost of executing buy orders from 0.3902 to 0.4090 basis points, while slippage costs for sell orders increase from -0.2553 to -0.2615 basis points. There is a reduction in slippage costs when compared to the control period. The cost of executing orders for the largest quartile was 0.7090 basis points for buy orders and -0.5155 basis points for sell orders. The greater slippage costs in this period are attributed to the impact of the global financial crisis. The increase in minimum tick has not had a significant impact on the on-market cost of executing large orders in the 3 Year bond futures contract.

# APPENDIX 1

## 10Year Commonwealth Treasury Bond Futures contract

The change in liquidity for the 3 Year Commonwealth Treasury Bond Futures contract may be a result of the increase in minimum tick or as a result of market-wide effects. To further improve the robustness of the analysis and ensure the change in liquidity resulted from the minimum tick change, we employ as a control contract the 10Year Commonwealth Treasury Bond Futures contract.

### Trading Activity

The average trade size and average daily volume transacted are presented in Figure 4 (Panel A). The average trade size of 8 contracts is smaller relative to the average trade size of 12 contracts in the May to August 2008 period. The average daily volume of 15,356 in the post period is lower relative to both prior periods. Average night time volume has also fallen when examining a year-on-year comparison. The growth in volume in the 3 year bond market therefore does not seem to be related to market wide impacts.

Figure 4, Panel A  
AVERAGE TRADE SIZE AND AVERAGE VOLUME DURING DAY TRADING

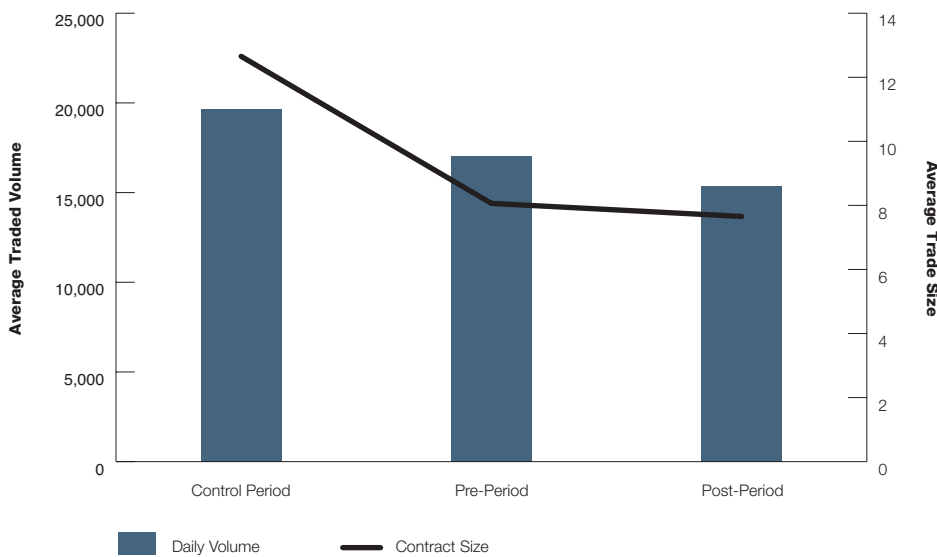
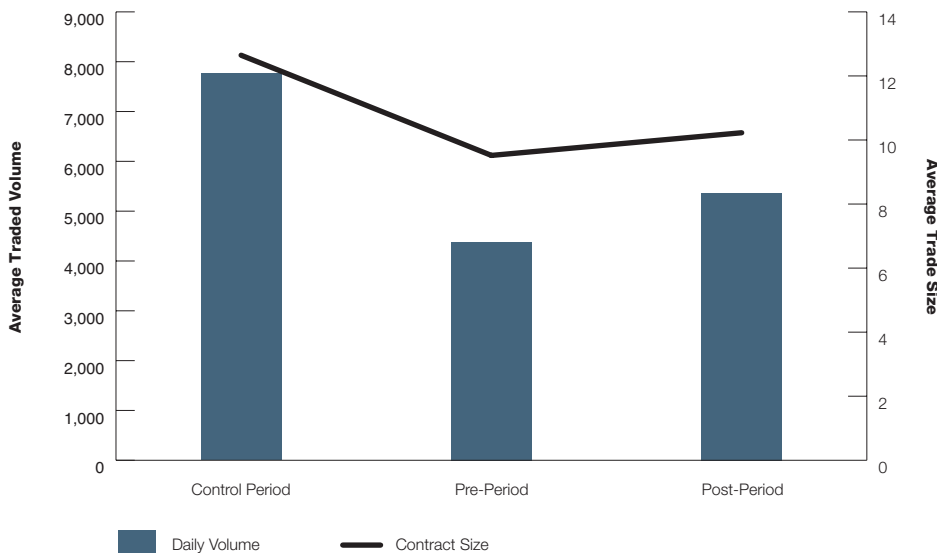


Figure 4, Panel B  
AVERAGE TRADE SIZE AND AVERAGE VOLUME DURING NIGHT TRADING



## Bid-Ask Spreads and Quoted Depth

Bid-ask spreads have remained fairly consistent across the three time periods. Prior to the increase in minimum tick, the 10 Year Commonwealth Treasury Bond Futures contract were trading at an average of 0.54 basis points. After the 3-Year minimum tick increment increase, spreads narrowed to an average of 0.52 basis points, as can be seen in Figure 5 (Panel A). Bid-ask spreads during the night trading session (Panel B) have also narrowed (0.90 basis points).

Results in Figure 5 (Panel A) show that average depth at the best prevailing quotes has increased from 110 to 140 contracts, though it has declined when looking at a year on year comparison. Total depth visible in the order book has increased after the structural change, though it has declined when examining a year on year comparison. A similar result exists for the night trading session (Panel B). Market trends indicate an improvement in liquidity from before to after the increase in the 3-Year minimum tick increment. The magnitude of the improvement in the 10 Year Commonwealth Treasury Bond Futures Contract however suggests that market-wide impacts cannot account for the change in liquidity for the 3 Year Commonwealth Treasury Bond Futures Contract.

Figure 5, Panel A  
AVERAGE BID-ASK SPREADS AND QUOTED DEPTH DURING DAYTRADING

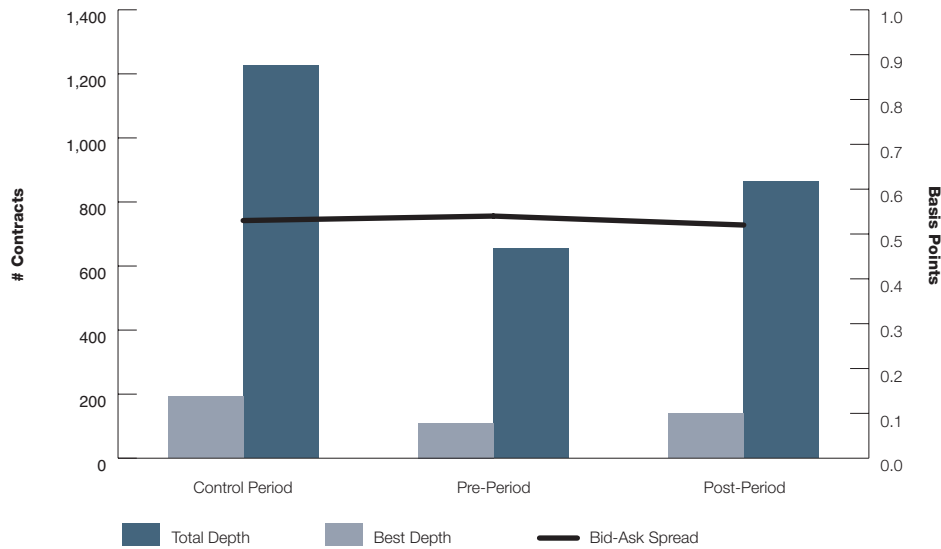
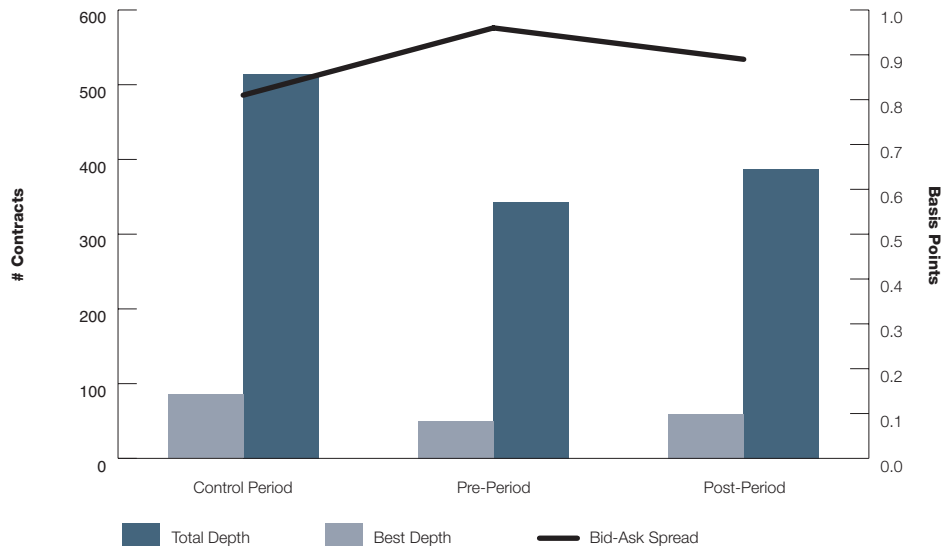


Figure 5, Panel B  
AVERAGE BID-ASK SPREADS AND QUOTED DEPTH DURING NIGHT TRADING



## Volatility

Results presented in Table 2 indicate that volatility is approximately equal before and after the change in market structure. The average daily range of 8.70 basis points in the post period is insignificantly different from 9.58 basis points in the pre-period. Also, the change in daily standard deviation of returns is minimal, being 0.033 percent before the change and 0.031 percent after the change.

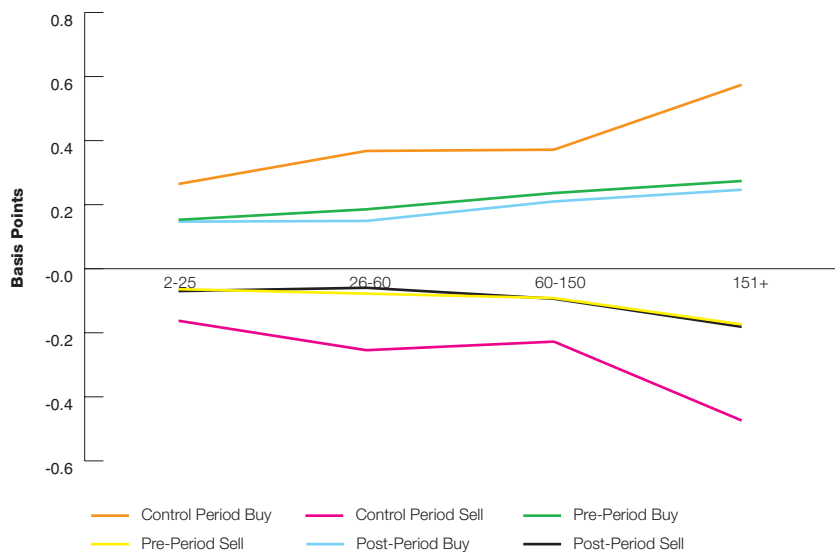
Table 2  
AVERAGE VOLATILITY DURING DAY AND NIGHT TRADING SESSIONS

	August 2008	May 2009	August 2009
<b>Panel A : Day Trading</b>			
Average Daily Range (B.P.)	7.55	9.58	8.70
Standard Deviation of Returns (%)	0.028	0.033	0.031
<b>Panel A : Night Trading</b>			
Average Daily Range (B.P.)	7.713	9.089	9.033
Standard Deviation of Returns (%)	0.025	0.041	0.034

## Slippage

Figure 6 presents slippage estimates for the four order size quartiles. Similar to the 3 Year Commonwealth Treasury Bond futures, there is an insignificant change in the cost of executing orders across the four quartiles from the pre-period to the post-period. Slippage costs for buy orders in the smallest trade size quartile decrease from 0.1527 to 0.1469 basis points while sell orders increase from -0.0638 to -0.0698 points. For the largest trade size quartile, there is a small decrease in the cost of executing buy orders from 0.2739 to 0.2466 basis points, while slippage costs for sell orders increase from -0.1737 to -0.1813 basis points.

Figure 6  
AVERAGE SLIPPAGE



## APPENDIX 2

*Data and methodology used to calculate slippage*

### Data

This paper uses a unique data set from ASX that contains date, price, time, volume, direction, contract code and account identifier fields for each trade executed. The account identifier field is an alphanumeric code indicating the account executing each order within the sample period.

### Packaging trades into orders

A sequence of trades is classified as an order if they

- 1) originate from the same account,
- 2) are in the same direction (buy or sell), and
- 3) are executed with less than a one-day trading break.<sup>3</sup>

This implies that an order from a nominated account ends when either the direction of trade changes or they stay out of the market for a period greater than one trading day.

We examine daytime trades executed in the near and deferred contracts and exclude trades that (1) occur 10 days prior to the expiration of the near contract, and (2) are executed completely by means of one contract.<sup>4</sup> Trades executed close to the expiration of the near contract are essentially investors rolling their position from the near to deferred contract, and trades executed using one contract by definition do not incur slippage. In order to proxy for institutional trades, locals are excluded from analysis.

### Measuring slippage

The slippage for order  $i$  beginning on day  $t$  is calculated as

$$\text{Slippage}_{i,t} = VWAP_{i,t} - \text{Open Price}_{i,t}$$

Where  $\text{Open Price}_{i,t}$  is the opening price recorded by Reuters on day  $t$ .  $VWAP_{i,t}$ , the volume weighted average price at which an order is executed, is calculated as follows:

$$VWAP = \frac{\sum_{i=1}^n S_i * P_i}{\sum_{i=1}^n S_i}$$

$S_i$  is the size of trade  $i$  making up the order, and  $P_i$  is the price at which trade  $i$  is executed and  $n$  is the separate number of transactions which make up the order.

The benchmark used to calculate slippage is the opening price on the first day of the order. We use the opening price as it is an unperturbed price that is independent of the order and is observed by all traders prior to executing their order. Using a benchmark price that prevailed prior to the order is consistent with current futures market literature.<sup>5</sup>

<sup>3</sup> This criteria of a one-day trading gap is consistent with current academic practice. See Frino, A. and T. Oetomo, 2005, "Slippage in Futures Markets: Evidence from the SFE," *Journal of Futures Markets*, 25(12), 1129-1146

<sup>4</sup> See Frino, A. and M. D. McKenzie, 2002, "The Pricing of Stock Index Futures Spreads at Contract Expiration," *The Journal of Futures Markets*, 22(5), 451-469

<sup>5</sup> See Frino, A. and Oetomo, T. (2005), 'Slippage in Futures Markets: Evidence from the Sydney Futures Exchange', *Journal of Futures Markets*, 25(12), 1129-1146

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