

MARKET INSIGHTS

The cost of executing large orders on the SFE: Update II



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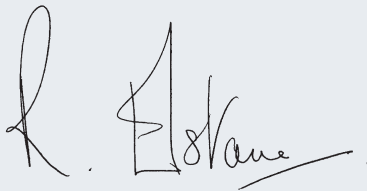
AUSTRALIAN SECURITIES EXCHANGE

FOREWORD

In this 22nd edition of Market Insights, Professor Alex Frino, Jennifer Kruk, and Dr. Andrew Lepone from the Discipline of Finance at the University of Sydney update earlier work reported in the 3rd and 11th edition of Market Insights.

This work examines the cost of executing large orders in the 3 and 10 Year Bond futures, 90 Day BAB futures, and the SPI200[®] index futures. Given the growth in derivative transactions over the past few years, such research is indeed timely. I trust you will find it both interesting and useful when examining the opportunities that the SFE might present to your particular organisation.

Regards



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The cost of executing large orders on the SFE: Update II

Professor Alex Frino, Jennifer Kruk and Dr. Andrew Lepone

EXECUTIVE SUMMARY

This paper provides estimates of slippage costs associated with executing large orders on the Sydney Futures Exchange. The orders examined include those of the size typically transacted by large institutions such as CTA's and fund managers. Using a sample of orders executed between June 30, 2004 and June 30, 2007 we find:

- There is little evidence that orders executed on the Sydney Futures Exchange incur slippage costs except for the very largest
- Slippage costs from June 2004 to June 2006 average *less than 0.68 ticks* for interest rate products, and *less than 0.83 ticks* for the SFE SPI 200™, across all order size categories
- Slippage costs from July 2006 to June 2007 average *less than 0.67 ticks* for interest rate products, and *less than 0.74 ticks* for the SFE SPI200™, across all order size categories
- As expected, estimated slippage costs increase with the size of orders, and
- Examination of orders in the largest size category from July 2006 to June 2007 show very large orders average slippage costs *less than 1.22 ticks* for interest rate products, and *less than 1.35 ticks* for the SFE SPI200™.

These findings suggest that slippage costs incurred in executing orders on the Sydney Futures Exchange are small, reflecting the high liquidity of the contracts.

Introduction

This paper provides estimates of the *on-market* cost, or ‘slippage’, of executing orders on the Sydney Futures Exchange. Slippage is defined as the extent to which the execution of a large order adversely affects the futures price. That is, the extent to which buy orders move the futures price upwards, or the extent to which sell orders move the futures price downwards.

Slippage is an implicit cost of trading in futures markets and has two potential causes; a temporary (liquidity) effect and a permanent (information) effect. A temporary price effect occurs when there is insufficient liquidity in the market to accommodate the order, and the price temporarily moves to a market-clearing level. A permanent price effect occurs when the order is perceived to convey information, and the market adjusts the price accordingly.¹

In this paper we use data for the period June 30, 2004 to June 30, 2007 for the four major contracts trading on the Sydney Futures Exchange. Slippage estimates of orders executed from July 1, 2006 to June 30, 2007 are compared with slippage estimates in prior years to determine changes in the level of slippage over time. To isolate slippage costs incurred by extremely large orders, we further examine the largest category of orders from July 1, 2006 to June 30, 2007.

1. Slippage: All orders

A Description of Orders Executed on the SFE

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 allows us to identify trades belonging to the same order. Our analysis focuses on slippage estimates for orders as opposed to individual trades (see Appendix). Table 1 describes the orders analysed in this paper.

Table 1

CHARACTERISTICS OF ORDERS EXECUTED ON SFE

This table reports the average number of contracts in an institutional order (Volume), the average number of hours taken to execute an institutional order (Duration), and the average number of trades in an institutional order (Trades). Panel A reports characteristics of orders executed between June 30, 2004 and June 30, 2006, and Panel B reports these characteristics for orders executed between July 1, 2006 and June 30, 2007.

Average	90 Day BAB futures	3 Year Bond futures*	10 Year Bond futures	SPI200™ futures
Panel A : 30 June 2004 – 30 June 2006				
Volume (contracts)	340.43	392.98	128.67	19.69
Duration (hours)	2.34	1.32	1.15	0.43
Trades (no.)	6.74	5.90	6.23	5.69
Number	57,456	89,321	103,058	432,876
Panel B: 1 July 2006 – 30 June 2007				
Volume (contracts)	402.05	453.05	170.19	16.45
Duration (hours)	3.23	2.09	1.78	0.48
Trades (no.)	6.47	5.80	6.02	6.00
Number	32,848	23,947	57,050	253,694

* For 3 year bond futures the sample period in Panel B is 15 December, 2006 to 30 June, 2007. This is the date from which the March and June 2007 contracts began trading at the new minimum tick of 0.005%.

1 Chan, L.K.C. and J. Lakonishok, 1993, “Institutional Trades and Intraday Stock Price Behavior,” *Journal of Financial Economics*, 33, 173–200

The number of orders examined from June 30, 2004 to June 30, 2006 is 57,456 for 90 Day BABs, 89,321 for 3 Year Bond futures, 103,058 for 10 Year Bond futures, and 432,876 for SPI200™ futures. From July 1, 2006 to June 30, 2007, 32,848 orders are examined for 90 Day BABs, 57,050 for 10 Year Bonds, and 253,694 for SPI200™ futures. From December 15, 2006 to June 30, 2006, 23,947 orders are examined for 3 Year Bond futures.

There is an increase in average order volume across all three interest rate products over time, whilst the average number of trades remains relatively unchanged. This is consistent with significant increases in SFE liquidity for interest rate contracts from July 1, 2006 to June 30, 2007, providing institutions with the opportunity to trade larger orders.

The magnitude of average order volume can be appreciated by considering the dollar value of the underlying position for each order. From July 1, 2006 to June 30, 2007, the average order size for 90 Day BABs was 402.05 contracts. This represents an equivalent order in the underlying security of approximately AUD 402 million (USD 316 million).² The average order size during this period for SPI200™ futures it is 16.45 contracts, and for 10 Year Bonds it is 170.19 contracts. These represent positions in underlying securities of approximately AUD 2 million (USD 1.5 million) for SPI200™ futures AUD 17 million (USD 13 million) for 10 Year Bonds.³ From December 15, 2006 to June 30, 2007, the average orders size for 3 Year Bond futures was 453.05 contracts. This represents an equivalent position in the underlying security of approximately AUD 45 million (USD 35 million).

Estimates of Slippage

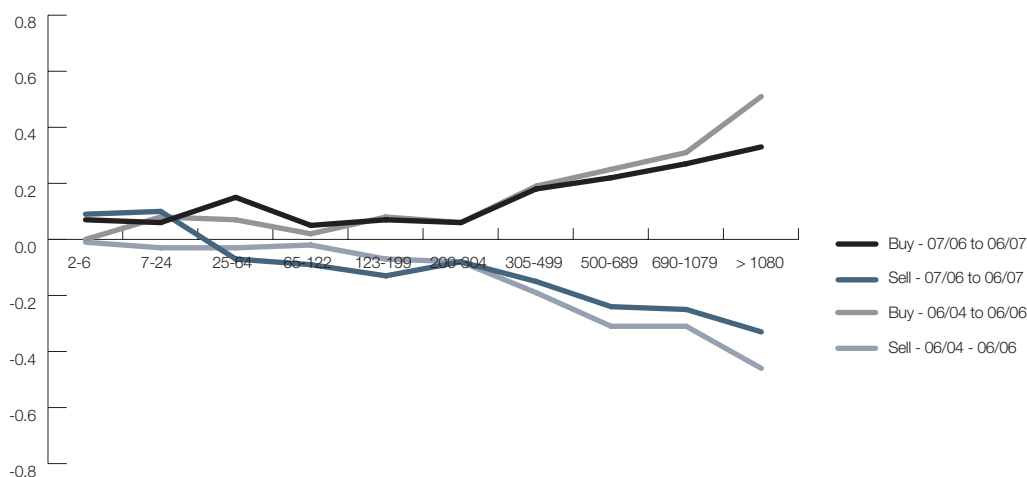
In order to measure slippage for each institutional order, the volume-weighted average price (VWAP) of each order is calculated. The opening price on the first day the order commenced executing is the benchmark price, as it represents an unperturbed price, independent of the order, observable to all traders prior to execution.⁴ Slippage is the difference between the VWAP of the order and the opening price of the first day of the order. If the VWAP of the order is greater than the opening price for purchases or less than the opening price for sales, the order has incurred slippage. The level of slippage sustained depends on the magnitude and direction of price pressure exerted by an order.

Figure 1 illustrates the average slippage incurred when executing various sized orders in 90 Day BAB futures, 10 Year Bond futures, and SPI200™ futures. Orders are ranked by their total volume and divided into 10 (approximately) equal groups for analysis. Slippage for July 1, 2006 to June 30, 2007 is plotted against slippage for June 30, 2004 to June 30, 2006.

Figure 1

ESTIMATES OF SLIPPAGE INCURRED IN EXECUTING DIFFERENT SIZE ORDERS IN 90 DAY BABS, 10 YEAR BONDS, AND THE SPI200™ (IN POINTS)

Panel A: 90 Day BAB futures



2 The exchange rate used is the average USD/AUD exchange rate over the period 1 July 2006 to 30 June 2007.
 3 The dollar value of the underlying equity position for one SPI200™ futures contract is calculated using the average index value from July 1, 2006 to June 30, 2007 multiplied by AUD 25 (the value of one S&P/ASX 200™ index point).
 4 See Appendix for further details of slippage calculation.

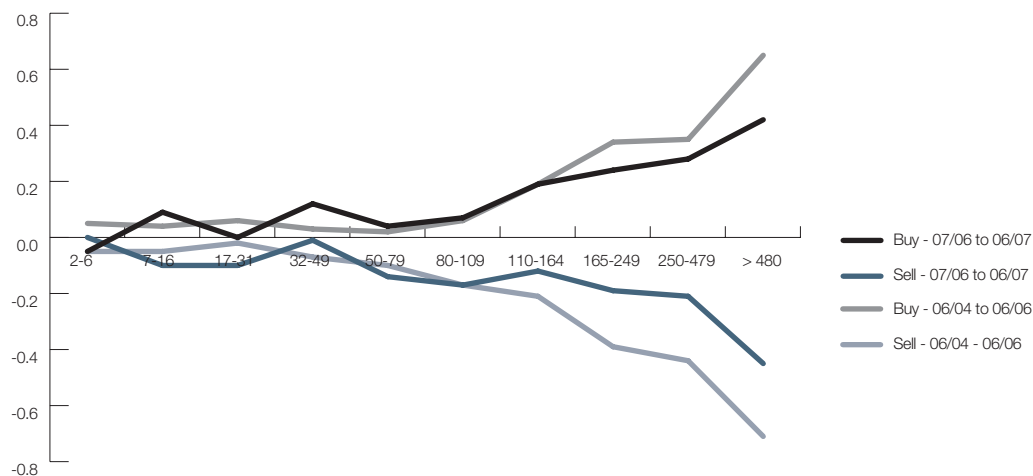
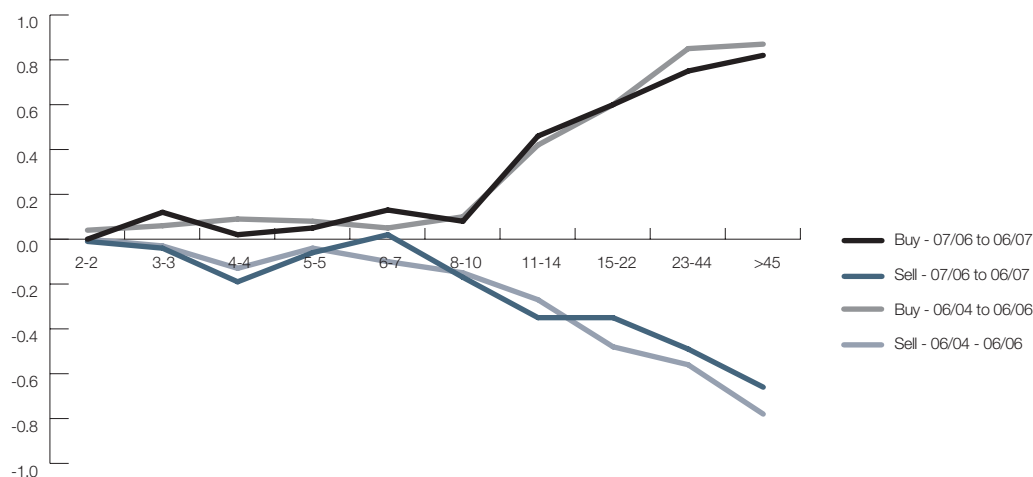
Panel B: 10 Year Bond futures**Panel C: SPI200™ futures**

Figure 1 depicts the average slippage across both sample periods for different sized orders in 90 Day BABs, 10 Year Bonds, and the SPI200. As expected, slippage increases with order size for each contract. A more notable result is that for each contract, slippage in the three largest categories from July 1, 2006 to June 30, 2007 is less than the slippage incurred from June 30, 2004 to June 30, 2006 in similar-sized orders.

In Panel A of Figure 1, average slippage for all orders in 90 Day BABs from June 30, 2004 to June 30, 2006 is no greater than 0.49 points. From July 1, 2006 to June 30, 2007, slippage in Panel A is no greater than 0.33 points; an average decrease of 0.16 points (a 33 percent decline). Panel B depicts a similar result for 10 Year Bond futures. 10 Year Bonds experience a decline in average slippage of (approximately) 35 percent when comparing the largest order category from July 1, 2006 to June 30, 2007 with the same category from June 30, 2004 to June 30, 2006. The increase of average order size and the simultaneous decline in slippage of large orders reflects the increase in volume and depth of 90 Day BAB and 10 Year Bond futures from July 1, 2006 to June 30, 2007. This liquidity improvement allows institutions to trade larger orders in interest rate products more profitably.

Panel C of Figure 1 reports average slippage for different sized orders in SPI200™ futures contracts. As expected, slippage increases with order size. Orders of SPI200™ futures executed between June 30, 2004 and June 30, 2006 incur average slippage no greater than (approximately) 0.83 points. In the most recent financial year, orders of SPI200™ futures incur average slippage of no greater than 0.74 points; an average decrease of 0.09 points (an 11 percent decline).

Figure 2 below reports average slippage incurred when executing various sized orders in 3 Year Bond futures. Orders are ranked by their total volume and divided into 10 (approximately) equal groups for analysis. To control for the tick size reduction implemented in December 2006, we only report slippage in 3 Year Bond futures for the period December 15, 2006 to June 30, 2007. Slippage during this time period cannot be directly compared to slippage from earlier years; however, the scales in Figure 2 are adjusted to facilitate a visual comparison. The scale on the LHS of Figure 2 measures slippage in ticks for the period December 15, 2006 to June 30, 2007, and the scale on the RHS measures slippage in ticks for the period June 30, 2004 to June 30, 2006. To account for the halving in tick size, the LHS scale is twice that of the RHS scale.

Figure 2
ESTIMATES OF SLIPPAGE INCURRED IN EXECUTING DIFFERENT SIZE ORDERS IN 3 YEAR BOND FUTURES (IN POINTS)

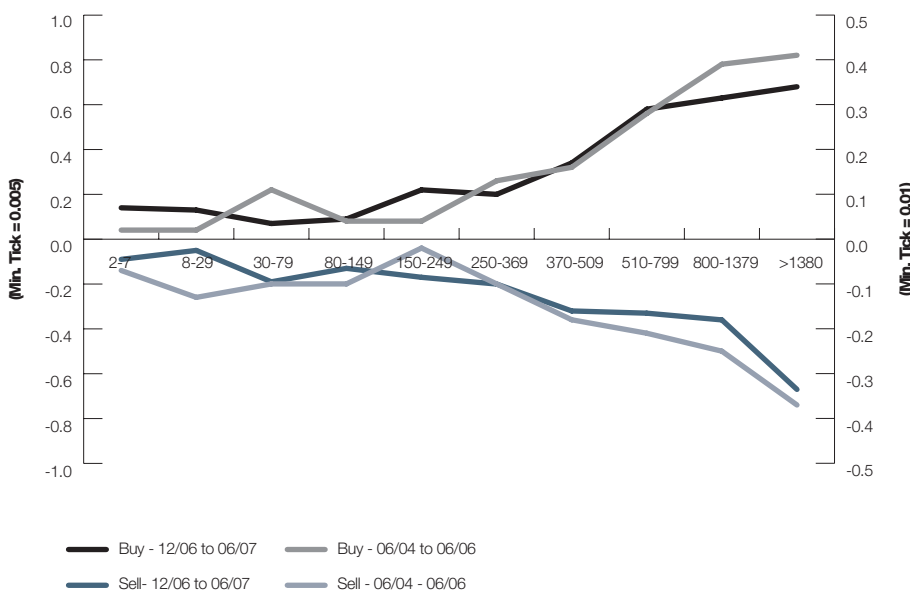


Figure 2 reports average slippage for 3 Year Bond futures. Whilst the reduction in tick size prevents us from directly comparing the most recent slippage levels with earlier years, the adjusted scales in Figure 2 permit a visual comparison. Based on the evidence presented in Figure 2, slippage levels in the largest three trade size categories for the period December 15, 2006 to June 30, 2007 are comparatively lower than slippage levels in earlier years.

2. Slippage: Largest orders

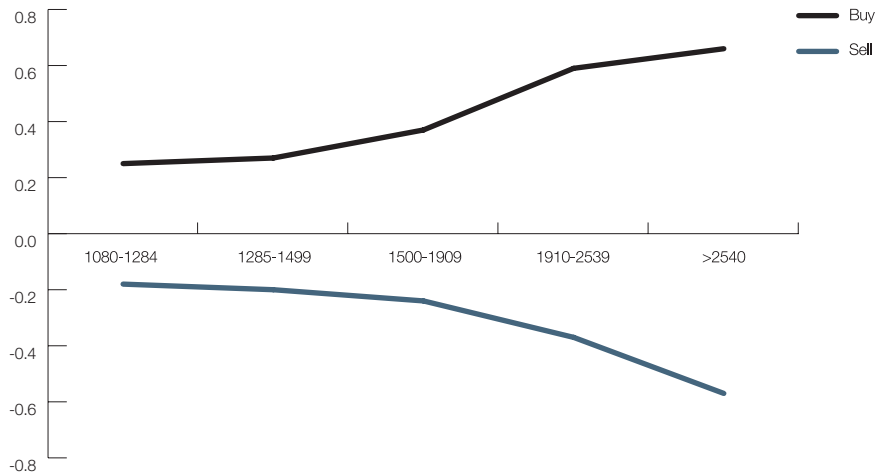
This paper also examines slippage for the largest decile of orders executed in four major SFE contracts from July 1, 2006 to June 30, 2007. The largest order category for each contract in Figures 1 and 2 are divided into five (approximately) equal groups, permitting assessment of very large institutional trades. The calculation of slippage for each group remains unchanged and is detailed in the Appendix.

Figure 3 reports slippage in the largest category of SFE interest rate futures and SPI200™ futures.

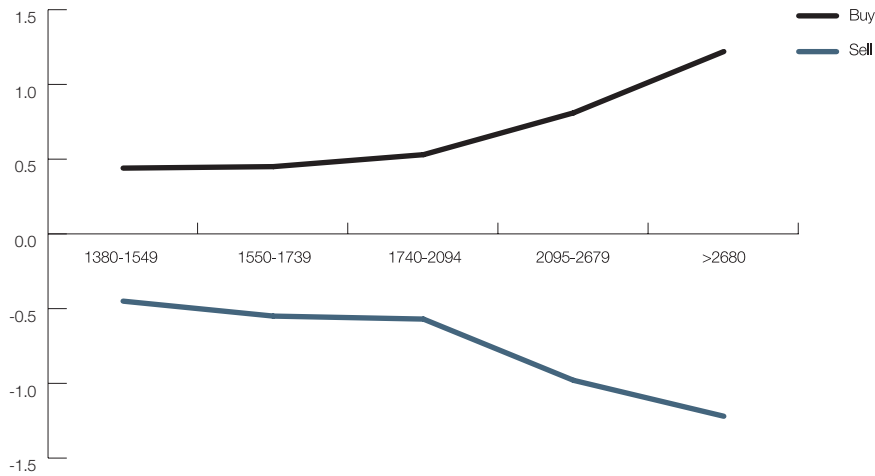
Figure 3
ESTIMATES OF SLIPPAGE INCURRED FOR DIFFERENT SIZE ORDERS WITHIN THE LARGEST ORDER CATEGORY (IN POINTS)

July 1, 2006 to June 30, 2007**

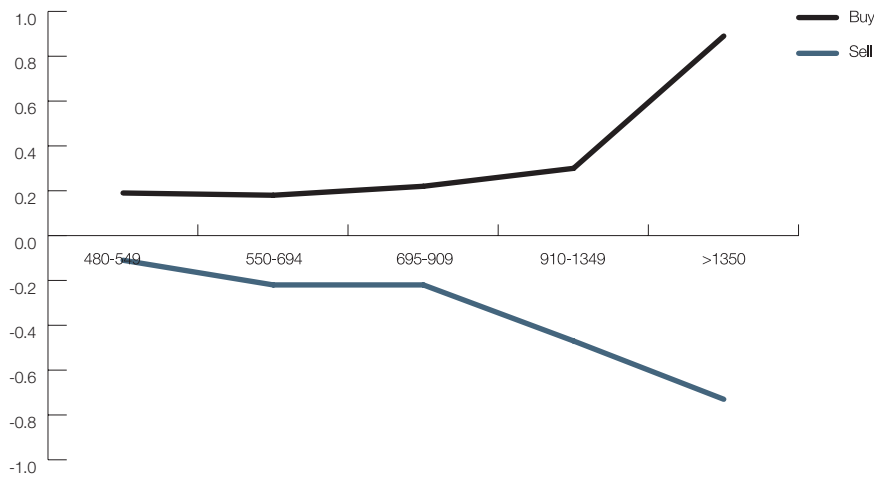
Panel A: 90 Day BAB futures



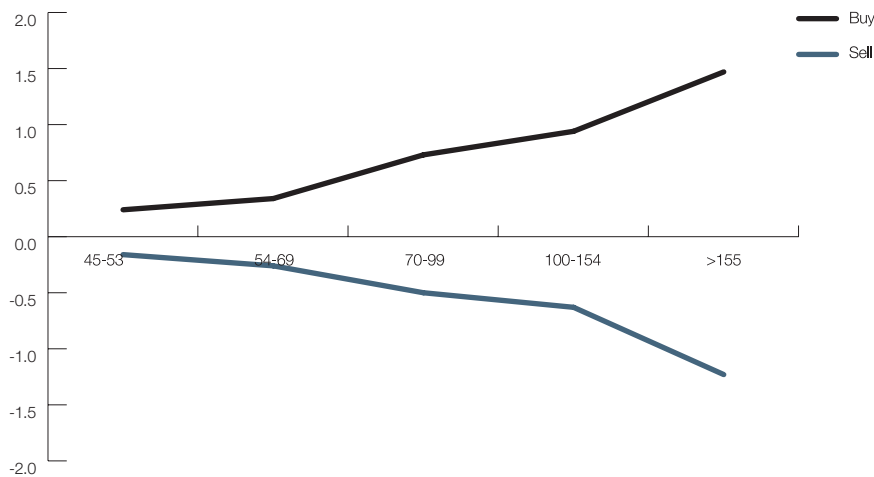
Panel B: 3 Year Bond futures



Panel C: 10 Year Bond futures



Panel D: SPI200™ futures



** Slippage for 3 Year Bond futures is reported for the period December 15, 2006 to June 30, 2007 only. This is to account for the tick size reduction implemented in December 2006.

Panels A, B, C, and D in Figure 2 document that for interest rate products and the SPI200™, slippage increases as order size increases. Panel A documents slippage for orders greater than 1,080 contracts in 90 Day BAB futures. The largest of these orders (>2,540 contracts) incur average slippage of 0.61 points. Panel B reports slippage for orders greater than 1,380 contracts in 3 Year Bond futures and Panel C reports orders greater than 480 contracts in 10 Year Bond futures. The average slippage for the largest orders executed in 3 Year Bonds (>2,680 contracts) is 1.22 points, and for 10 Year Bonds the average slippage for the largest orders (>1,350 contracts) is 0.81 points. Panel D reports slippage for orders greater than 45 contracts in SPI200™ futures. The average slippage for the largest orders executed in SPI200™ futures (>155 contracts) is 1.35 points.

These findings confirm the liquidity of SFE interest rate products and the SPI200™. The largest category of orders presented in Panel A of Figure 3 incur (approximately) the bid-ask spread with virtually no additional market impact. The largest orders in Panels C incur the spread with additional market impact no greater than 0.3 points, and the largest orders in Panels B and D incur the spread with additional market impact costs no greater than 1 point.⁶ This analysis shows exceptionally large orders in interest rate contracts and the SPI200™ on the SFE incur minimal market impact costs over and above the bid-ask spread.

6 This assumes the spread is 1 point.

APPENDIX 1

Data and methodology used to calculate slippage

Data

This paper uses a unique data set from the Sydney Futures Exchange that contains date, price, time, volume, direction, contract code and account identifier fields for each trade executed between June 30, 2004 and June 30, 2007. 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.⁷

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.⁸ 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.⁹

⁷ 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

⁸ 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

⁹ 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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