Execution costs in futures markets

You place an order to buy futures, and as it executes, the price moves against you. ALEX FRINO, TRO KORTIAN, TEDDY OETOMO and GRANT WEARIN provide some much needed research into the problem of price slippage.

In this paper the authors provide estimates of the on-market cost of executing large orders on the Sydney Futures Exchange and more specifically, estimates of 'slippage' or price impact incurred in executing orders. Slippage is defined as the extent to which the price moves against an order during execution, thus reducing the profitability of a futures position. Hence, it refers to the extent to which an order to buy a large quantity of futures contracts moves the futures price upwards, or the extent to which an order to sell a large quantity of futures contracts moves the price downwards.

Slippage reflects two main factors. First, "liquidity costs", where large orders represent a temporary imbalance in the supply or demand for futures contracts causing prices to adjust to a market clearing level, and second, what is commonly referred to as the "information content" of an order, where a large order may be perceived to be executed by a better informed trader causing a permanent revision to the futures price.

In contrast to equity markets, research examining slippage in futures markets is scarce. The lack of research is surprising because of the importance of futures as a mechanism for obtaining exposure to equity market movements and because the average daily trading value of stock index futures is approximately equal to the average traded value of underlying stocks.

In Australia, the average daily trading value of SFE SPI 200™ is around AUD1.5 billion, whereas the average daily turnover of all equity trades executed on the Australian Stock Exchange (ASX) is around AUD2.76 billion.

The magnitude of slippage in futures markets is expected to be smaller than that of equity markets. Relative to equity markets, futures markets are far more liquid, traders are less likely to be motivated by information and markets are not confined by short-selling restrictions or segmented into upstairs and downstairs markets.

This article demonstrates that the average slippage for the SFE SPI 200™, 90 Day BAB, 3 Year Bond and 10 Year Bond futures is 0.70, 0.26, 0.42 and 0.46 ticks respectively, which is less than 2 basis points relative to contract value. In comparison, Gallagher and Looi (2003) document that Australian active fund managers incur a one-way market impact cost of around 13.5 basis points.

A DESCRIPTION OF ORDERS EXECUTED ON SFE

In this paper we use data for the period 1 January 2004 to 31 December 2004 for the SFE SPI 200™ futures, 90 Day Bank Accepted Bill futures, 3 Year Bond futures and 10 Year Bond futures contracts trading on the Sydney Futures Exchange, to estimate the slippage associated with different sized orders. The data excludes trades that are executed within the last 10 trading days.

Institutional orders are often broken up into smaller trades and executed over substantial periods of time in order to minimise slippage. Consequently, trades are grouped into "packages" or orders in the following way for analysis.

Alex Frino PhD
Professor, Finance,
School of Business,
University of Sydney

Troy Kortian
Lecturer, Finance,
School of Business,
University of Sydney

Teddy N. Oetomo PhD
Analyst, Credit Suisse,
Hong Kong

Grant Wearin
PhD candidate,
Finance, School of Business,
University of Sydney
If a sequence of transactions is (1) executed by the same account, (2) in the same direction (e.g., buy trades), and (3) executed consecutively without a one-day trading break, then it is considered part of the same order. Typically, the "end" of a particular trade package or order is identified when (1) the direction of trade from an account changes (e.g., buy to sells), or (2) an account remains inactive for one trading day.

Orders which are (1) executed within 10 days of expiration of a contract, or (2) involve one trade only, are excluded from analysis. Orders executed within 10 days of expiration are likely to be part of a calendar-spread transaction (i.e., a "roll"), and orders executed through a single transaction are unlikely to be executed by institutions. Such transactions are less likely to result in slippage and are consequently omitted from analysis.

The number of trade packages examined in this paper are 21,147 in the SFE SPI 200™, 12,307 in 90 Day BABs, 13,345 in 3 Year Bond and 11,856 in 10 Year Bond futures. The average number of contracts executed in an average order is 71.47 in the SFE SPI 200™, 349 contracts in 90 Day BAB futures, 397 contracts in 3 Year Bond futures and 186 contracts in 10 Year Bond futures. These trades are equivalent to an order in underlying securities with a total face value of AUD6.3 million, AUD344 million, AUD51.6 million and AUD19.5 million respectively.

Table 1 documents that the average time to execute an order (duration) is between 11 and 21 hours, suggesting it takes between one to two days to execute the average order. Table 1 also shows that the average order was generally broken into 7.2 to 13.2 separate trades, depending on the contract.

### Table 1: Characteristics of Orders Executed on SFE

<table>
<thead>
<tr>
<th></th>
<th>SFE SPI 200™ Futures</th>
<th>90 Day BAB Futures</th>
<th>3 Year Bond Futures</th>
<th>10 Year Bond Futures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume (contracts)</td>
<td>71.47</td>
<td>349.80</td>
<td>397.37</td>
<td>185.79</td>
</tr>
<tr>
<td>Duration (hours)</td>
<td>20.22</td>
<td>13.24</td>
<td>10.72</td>
<td>13.79</td>
</tr>
<tr>
<td>Trades (no.)</td>
<td>13.21</td>
<td>7.20</td>
<td>5.83</td>
<td>9.01</td>
</tr>
<tr>
<td>No</td>
<td>21,147</td>
<td>12,307</td>
<td>13,345</td>
<td>11,856</td>
</tr>
</tbody>
</table>

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**ESTIMATES OF SLIPPAGE**

Slippage is analogous to the total price impact measure in previous literature. To estimate slippage, we first calculate the volume-weighted average price (VWAP) at which each order was executed. The price at which the first trade in an order was executed is used as a benchmark, and hence slippage is the difference between the price of the first trade in the order and the VWAP at which the order was executed. This represents an estimate of the extent to which the price moved away from the trader throughout execution of the order. If the price at which a position is bought is greater than the first price, or if the price at which a position is sold is less than the first price, then execution of the order has incurred slippage.

Slippage of institutional orders is lower than the full amount of price impact as earlier trades incur lower slippage. For example, as illustrated in Figure 1, a buy order that is broken into three equally sized trades which incur 10 basis points in slippage a 20 basis point price movement $[0.010 \times \frac{1}{3} + 0.010 \times \frac{1}{3} + 0.010 \times \frac{1}{3} = 0.010]$.

Figure 2 (overleaf) depicts the average slippage incurred in executing orders of different sizes. To form the different size categories, orders were ranked from the smallest to the largest and then divided into (approximately) 10 equally sized groups with the exception of the decile containing the largest orders, which has been split into two categories, each containing roughly five percent of orders.

The average slippage incurred in executing orders in SFE SPI 200™ futures is generally less than 2.6 ticks for all the different size categories. As expected, the slippage increases from small to large orders averaging 2.4 ticks for the largest buy and sell orders. Since a buy or sell which is executed using a market order is expected to incur half the bid-ask spread, then the analysis presented here suggests that the largest orders executed in the SFE SPI 200™ incur slippage which is roughly 2 ticks greater than the bid-ask spread.

Using data provided by Plexus group in the US, a recent study estimates the average market-impact cost incurred by (predominantly) US fund managers in executing orders in Australian stock around 20 basis points. They also document that the cost of transacting in US equities is around 36 basis points. More recently, Gallagher and Loy (2003) document that Australian active fund managers incur a one-way market impact cost of around 13.5 basis points. By comparison, average slippage in SFE SPI 200™ is approximately 0.70 ticks or around 1.96 basis points relative to contract value, underlining the transaction cost benefits of a synthetic position.
over a position in the cash market.

As anticipated, slippage in interest rate futures increases from the smallest to the largest orders for all of the interest rate products. Figure 2 illustrates that the average slippage incurred in executing orders in 90 Day BAB, 3 Year Bond and 10 Year Bond futures is 0.26, 0.42 and 0.46 ticks for all the different size categories respectively. This implies that the average slippage incurred in executing orders in 90 Day BAB, 3 Year Bond and 10 Year Bond futures is around 1 basis point relative to contract value.

Apart from the two largest orders, slippage is generally less than half the minimum tick for 90 Day BABs. This suggests that the orders executed in BAB futures incur little more than the bid-ask spread with little or no additional market impact. This is also true for orders executed in 3 Year Bond futures. Apart from the two largest orders, slippage is less than 1 tick for the 10 Year Bond futures.

**CONCLUSION**

This paper examines the magnitude and determinants of slippage for orders executed in SFE SPI 2000™, 90 Day BAB, 3 Year Bond and 10 Year Bond futures listed on the Sydney Futures Exchange (SFE). Slippage is estimated at between approximately 0.5 and 2 ticks across contracts, for the very largest trades. Estimates of slippage in futures markets is significantly smaller in magnitude than estimates based on equity markets reported in prior research.

**References**


Notes
3 Fleming, Ostdieck and Whaley (1996).
4 For stock index futures, stock-specific information asymmetry is diversified away (Subrahmanyam, 1991 and Gorton and Pennachi, 1993) and the likelihood of trades in interest rate futures to contain private information is small as this would require leakage of information by government institutions which release macroeconomic information (e.g. Australian Bureau of Statistics). Short-selling restrictions discouraged liquidity providers to facilitate large purchases, whereas upstairs markets extract liquidity from the primary markets (Booth, Lin, Martikainen and Tse, 2002).
5 Frino and McKenzie (2002) document that a sharp increase in trading volume and the magnitude of spread mispricing occurs roughly 10 days prior to expiry of the nearest-to-delivery contract.
7 Since slippage is calculated using the first price generated in executing a transaction, by definition, orders executed with one transaction do not incur slippage.
8 Assuming that the bid-ask spread is roughly around 1 tick.