

# **Do monopolistic market makers improve market quality? Evidence from an electronic options market**

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## **Do monopolistic market makers improve market quality? Evidence from an electronic options market**

### **1. Introduction**

In January 2007 The Sydney Futures Exchange (SFE) introduced a designated market maker to the Options on 90 Day Bank Accepted Bill Futures (90 Day BAB options) contract. The purpose of this study is to determine the effect of this change on several important market quality indicators, in particular traded volume, depth and bid-ask spreads. Through use of a unique data set provided by the SFE we are also able to analyse the trading behaviour of the market maker upon the commencement of market making activities.

On the SFE, 90 Day BAB options trade via an electronic limit order book. The introduction of a market maker to this structure provides an opportunity to analyse an interesting trading environment. In this setting the market maker is obliged to quote continuously with maximum spread requirements, does not necessarily possess an information advantage (the order book is fully transparent) and must compete with public limit order traders. The only advantage that the market maker possesses over other traders is that he is remunerated for his services and his compensation schedule provides incentives to trade larger volumes.

Our results indicate that traded volume increases significantly following the introduction of the market maker. Prior to introduction the average daily volume is 298.5 while after

January 2007 average daily volume is 1412.9 – an increase of approximately 370%. These figures are robust to market trends over the sample. This result is consistent with a profit maximising market maker operating under the incentive structure and market conditions outlined above. Specifically, an increase in volume is consistent with an incentive structure that is tied to volume transacted.

Percentage bid-ask spreads and depth are not significantly different following the change. This result is somewhat affected by the availability of the data on bid-ask spreads and depth, which are only captured immediately prior to a trade. Bid-ask spread measures are biased downwards because trading is more likely to occur when the spread is relatively narrow. Similarly, depth is biased upwards because trading is more likely when depth is greatest. Due to this feature of the data, a comparison between pre- and post-market maker periods might not generate significantly different results. Despite this we suspect that market quality has improved in the post-market maker period due to the significantly greater trading volume and the amount of competition faced by the market maker. Greater competition in markets tends to lead to lower spreads and transaction costs. An analysis of trades shows that the market maker participates in only 13.6% of trades.

This empirical research follows similar lines of inquiry which analyse the introduction of one or more market makers to trading environments. Ellis, Michaely and O'Hara (2002) examine the entry and exit of market makers in Nasdaq securities during the first seven months after listing. Despite the competitive appearance of a multiple market maker system, they find that securities tend to be dominated by a single market maker. Spreads

are positively related to the volume transacted by the dominant market maker. Tse and Zabolina (2004) examine the introduction of a designated market maker to the 10-year interest rate swap futures contract on the CBOE, while Anand and Weaver (2006) examine the introduction of a market maker to various CBOE equity options. Both studies conclude that the introduction of the market maker improves market quality, with lower bid-ask spreads (Tse and Zabolina, 2004 and Anand and Weaver, 2006), greater pricing efficiency and increased volume (Tse and Zabolina, 2004). Finally, Eldor, Hauser, Pilo and Shurki, 2006 analyse the introduction of three market makers to currency options on the Tel Aviv Stock Exchange (TASE), an electronic market. Their results are also supportive of market maker imposition, citing increased efficiency and greater transacted volume.

The rest of the paper is organised as follows. Section 2 outlines the institutional detail of the SFE and the obligations imposed upon the market maker. Section 3 describes the data. Section 4 presents the results and Section 5 concludes.

## **2. Institutional Detail and Market Maker Obligations**

The Sydney Futures Exchange operates as the largest derivative exchange in the Asia Pacific Region by notional value of trading.<sup>1</sup> It provides a market for a number of securities, with the most actively traded being the SPI™ 200 futures and several interest rate futures. The security analysed in this study is an option on one of the top five futures contracts traded on the exchange – the 90 Day Bank Accepted Bill Futures contract. This

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<sup>1</sup> Aitken, Frino, Hill and Jarnecic (2004) and Frino, Harris, McInish and Tomas (2004).

market (as are all markets on the exchange) is setup as an electronic limit order book, where public limit orders provide the liquidity for those that wish to trade immediately. In certain markets, a market maker is employed to provide quotes and facilitate trade.

In 90 day BAB options the market maker is obliged to provide continuous two-way quotes during 75% of the trading day for strike prices with a delta range between 0.05 and 0.5 in the spot serial, spot quarterly and near deferred quarterly contracts.<sup>2</sup> The minimum quoted volume per side must be at least 100 lots and the bid-ask spread can be no greater than 4 ticks (2 basis points) in the spot contracts or 6 ticks (3 basis points) in the near deferred contract. For contracts outside the expiry months where the market maker must provide continuous quotes, market participants can request a quote from the market maker, who must respond to 75% of these requests. Additionally traders can request prices for custom option strategies.

The privileges granted to the designated market maker in return for providing liquidity in the market include a reduction in standard exchange fees from 90cents to 45 cents for each contract traded, a market maker fixed payment of \$25,000 AUD per year and a volume related payment.<sup>3</sup> If the market maker receives no volume related payments then the amount of new trading that must be generated by the market maker in order for the exchange to 'break-even' is approximately 18,520 contracts per year. This figure assumes that the market maker participates in every new trade and pays the reduced fee of 45

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<sup>2</sup> The most actively traded options are those that expire quarterly with the underlying futures contract (March, June, September, December). Serial contracts are those that expire outside these contract months.

<sup>3</sup> The structure of this payment can be found in the Appendix.

cents per contract. If new trading occurs between non-market maker participants then the exchange breaks even at approximately 13,890 contracts per year.

### **3. Data**

The time period examined in this study is 1 April 2006 to 31 August 2007, corresponding to eight months either side of the market maker introduction. The data includes every single trade (price and volume) executed during this period, time stamped to the nearest second. We also capture the prevailing bid-ask spread and prevailing depth before the trade. Importantly, the data also includes an indicator variable which describes the broker on each side of the trade. With this field we are able to discern in which trades the market maker was a participant. The data covers both serial and quarterly contracts, however intra-day and overnight options are excluded from the analysis for liquidity purposes. The maximum number of trades available for analysis is 116 and 856 in the pre-market maker period and post-market maker period respectively, though there are some missing observations depending on the variable considered.

## 4. Results

### 4.1 Univariate Results

Table 1 presents average values across the sample period for the following variables:

*Percentage spread* – the prevailing bid and ask prices are captured immediately prior to a trade. The percentage spread is the difference between the ask and bid prices divided by the transaction price.

*Depth* – the amount of volume available at the best bid and ask is captured immediately prior to a trade. This variable is the sum of these two figures.

*Trade size* – the amount of contracts traded in a single transaction.

*Daily volume* – the amount of contracts transacted during each trading day.

The results indicate that percentage spreads are not significantly different across the sample period. Percentage spreads in the pre-period are 0.3121 while in the post period they are 0.3244. When broken down into calls and puts the null result remains, though it appears that percentage spreads on puts are higher than that on calls. With depth there is no difference between the pre and post market maker periods when puts and calls are considered together. However, when considered individually depth for call options has increased, whereas depth for put options has decreased.

The results for spreads and depth conflict with those documented in Tse and Zobotina, (2004) and Anand and Weaver, (2006). Our results may be attributable to the nature of the data collected. These variables are only available immediately prior to a trade which places a natural bias on these figures. Bid-ask spread measures are biased downwards because trading is more likely to occur when the spread is relatively narrow. Similarly, depth is biased upwards because trading is more likely when depth is greatest. Due to this feature of the data, a comparison between pre- and post-market maker periods might not generate significantly different results.

The most significant improvement in market quality is the daily transacted volume. Following the introduction of the market maker, volume increased from an average of 299 lots to 1413 lots per day. Most of this gain occurred with call options which increased from a daily average of 167 to 1025 contracts per day. Importantly, these results are significant and the variables are unbiased. It is possible to conclude that the market maker has had a positive effect on market liquidity. In the next section we determine if these volume results are robust to overall market trends.

#### *4.2 Multivariate results*

Over the sample period there were several increases in short term interest rates. The expectation and uncertainty associated with these rises tends to generate more trading activity in interest rate markets, especially short term instruments such as 90 day BAB options. To investigate whether the change is robust to market trends we estimate the following regression with daily observations:

$$Volume = \alpha + \beta_1 D + \beta_2 Futures\_Volume + \beta_3 Futures\_Volatility + e$$

Where:

*Volume* – the volume traded in 90 day BAB options

*D* – a dummy variable that takes the value of 0 during the pre-market maker period and a value of 1 in the post market maker period.

*Futures\_Volume* – the contemporaneous volume traded in 90 day BAB futures

*Futures\_Volatility* – the standard deviation of 90 Day BAB futures prices over the trading day

Volume and volatility for the underlying contract are used to control for market wide factors. The intuition behind their inclusion in the regression specification is that any change to options volume associated with market wide factors such as interest rate uncertainty, should also manifest itself in the futures market. Therefore futures market based variables provide a natural control.

The results of the regression are presented in Table 2. The results indicate that there has been a significant increase in traded volume after the introduction of the market maker which is not attributable to general market conditions. Specifically, the introduction of the market maker corresponds to new trading approximately equal to 420 contracts per day. This is well beyond the amount of contracts required for the exchange to ‘break-

even', in terms of new revenue generated relative to the cost of the market maker. Interestingly, the data indicates that trading by the market maker is not the sole reason for the increase in trading volume. The market maker accounts for an average of 270 contracts of daily trading indicating that some proportion of new trading is directly attributable to trading by the market maker, whereas some proportion of new trading is attributable to trading between non-market maker participants. It appears that the guarantee of liquidity provided by the market maker induces greater trading amongst other market participants.

## **5. Conclusion**

The introduction of the market maker has improved traded volume in the 90 Day BAB options market. Results of the regression analysis indicate that the presence of the market maker accounts for 420 contracts of new trading, net of market conditions. Bid-ask spread and depth values are not significantly different following the introduction of the market maker, though this may be due to the nature of the data available for analysis.

Tables

**Table 1**

<b>Panel A: All</b>				
Variable	Pre market maker	Post market maker	Mean change	t-statistic for differences
Percentage spread	0.3121	0.3244	0.012	0.26
Depth	1472	1556	83	0.57
Trade size	450	488	38	0.82
Daily volume	299	1413	1114	5.34

  

<b>Panel B: Calls</b>				
Variable	Pre market maker	Post market maker	Mean change	t-statistic for differences
Percentage spread	0.2919	0.3158	0.024	0.41
Depth	1337	1754	417	2.08
Trade size	456	487	32	0.54
Daily volume	167	1025	858	7.93

  

<b>Panel C: Puts</b>				
Variable	Pre market maker	Post market maker	Mean change	t-statistic for differences
Percentage spread	0.3404	0.3521	0.012	0.14
Depth	1631	971	-661	3.60
Trade size	444	492	48	0.59
Daily volume	132	388	256	2.78

**Table 2**

	Coefficient Value	t-statistic
<i>Intercept</i>	203.4	4.22
<i>D</i>	419.8	2.54
<i>Futures_Volume</i>	0.006	5.67
<i>Futures_Volatility</i>	1.34	1.45

## Appendix

<b>Eligible Contracts (000s)</b>	<b>Volume Related Payment</b>
Less than 275	Nil
275 to 300	\$25,000
300 to 325	\$37,500
325 to 350	\$50,000
350 to 375	\$62,500
375 to 400	\$75,000
400 to 425	\$87,500
425 +	\$100,000

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